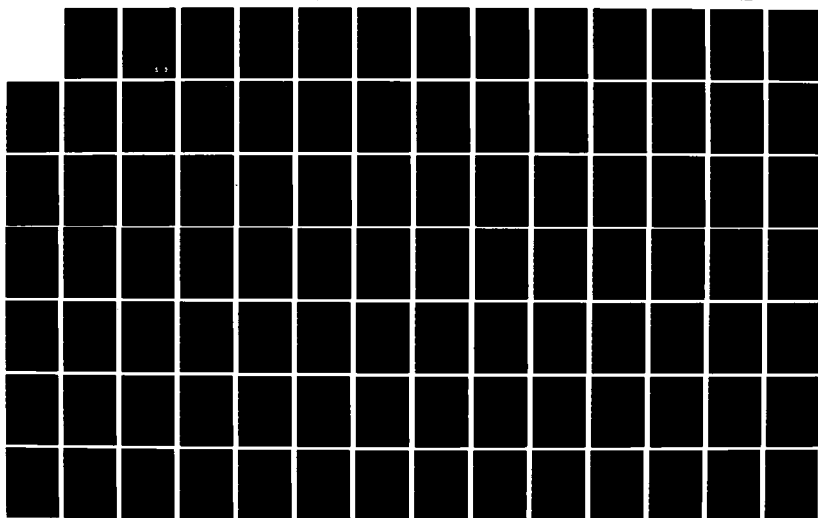


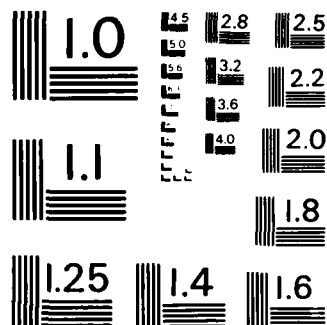
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THE OPTICAL SPECTRA OF AEROSOLS
Final Technical Report

by

F. Borghese

February 1985

United States Army
EUROPEAN RESEARCH OFFICE OF THE U.S. ARMY
London England

CONTRACT NUMBER DAJA37-81-C-0895

Contractor: F. Borghese

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
<p>The microscopic optical constants of an aerosol of model nonspherical particles are calculated. The effect of chemical reactions on the spectra of the aerosols are taken into account. The computer programs necessary to perform the above mentioned calculations are listed and an user's guide is supplied.</p>		

Introduction

In this Report we describe the work done by the principal investigator (Prof. F.Borghese) and his collaborators (Prof. P.Denti, Prof. G.Toscano and Dr R.Saija) under contract DAJA37-81-C-0895 from October 1981 to November 1984. The whole research has been performed in strict collaboration with Dr O. I. Sindoni, CRDC, Aberdeen P.G., 21010 Md., USA.

In Part A we connect the work done in the years 1979-1981 under Grant DAERO78-G-106, to the work done in the last three years under the present Contract. The work itself is actually described in the papers thus far published or accepted for publication. A brief account of the problems met in the course of the work as well as a suggestion of possible solutions and sketch of the lines of future progress are also included.

In Part B is described the work done by F.Borghese, P.Denti and R.Saija during their stay at CRDC from August 18th to September 23rd, 1984 under Contract Modification P0004. Essentially the work consists of two modifications of the computer programs for the scattering properties of clusters. The purpose of these modifications is twofold: on one hand they allow the treatment of relatively large clusters; on the other hand they constitute the basis for the calculations of the properties of scatterers in which resonances occur. A description of the programs as well as a guide to the input and output quantities is included.

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PART A

In the years from 1979 to 1981, working under Grant DAER078-G-106, we devised a model scatterer suitable to approximate the electromagnetic scattering properties of non-spherical particles. By inspiring to the well known stick-and-ball model of a molecule, we approximate a non-spherical particle as a cluster of spheres. The computation of the scattering properties of such an object do not require a big effort, thank to an addition theorem for vector Helmholtz harmonics⁽¹⁾ formulated by the present authors. As a consequence several calculations on clusters of various geometries proved the model to be computationally sound and able to account for the lack of overall spherical symmetry of some kind of non-spherical particles. A detailed account of the model as well as the use of the Group Theory to reduce the size of the computations is contained in the Final Report to Grant DAER078-G-106, October 1981, as well as in a number of published papers⁽²⁻⁴⁾.

In the years from 1981 to 1984, i.e. under the present Contract, we were able to take full advantage of the peculiarities of the cluster model in order to connect the scattering properties of individual clusters to the macroscopic optical properties of a dispersion of clusters of random orientation⁽⁵⁾. Furthermore, the flexibility of the cluster model allows the calculation of the changes in the macroscopic optical constants of an aerosol, when the clusters change their shape or when more clusters combine together to give scattering objects of different structure. The calculations show that these changes of shape produce quite detectable variations in the

absorption coefficient of the dispersion⁽⁶⁾.

These results have been recently presented at the 1st Joint International Conference on Aerosol Research, held in Minneapolis, MN, from September 17th to 21st^(6,7). In particular it has been emphasized the rather striking result that for a cluster of given structure and size parameter there exist a wavelength at which it behaves as a spherical particle. This conclusion is confirmed by a number of experimental findings of which we were informed during discussions on the subject.

We want to stress that the approach we used to connect the individual to the collective optical properties is rather elementary as it neglects the effects of multiple scattering among different clusters. As a consequence, our approach is applicable only to low-density dispersions such as atmospheric aerosols but it is unlikely to give reliable results when applied to dense dispersions such as e.g. smokes. We plan to overcome these difficulties by investigating the subject along three lines. First of all we plan to include the statistic of the particles into our formalism, so as to account, on the average, for the effect of multiple scattering and thus make the theory applicable to dispersions of relatively high density. Second, we are going to study the size distribution effect, for it has been shown that the occurrence of some size distributions can affect drastically the macroscopic optical properties of the dispersion.

Third, we will attempt to adapt our theory to the framework of the effective medium theories in order to calculate the effective dielectric constant of the dispersion. We got this idea at the Annual Meeting of Spectroscopy Group of the Gruppo Nazio

nale di Struttura della Materia held in Alghero, Sardinia,
where the problem of small clusters has been thoroughly discuss
sed.

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York 1984, pag.817.

The references with an asterisk were published under Grant
DAERO-78-G-106 and they are cited for the comodity of the
reader.

PART B

This part of the present Report is meant to be a user's guide to our programs for the scattering properties of clusters. Before we go into the description, however, we want to explain why we felt necessary to write two further versions of the programs we used in the past.

Our treatment of the scattering from clusters is based on a multicentered expansions of the scattered field in terms of spherical multipoles. For convergence reasons, as explained in the included literature, this expansion must be carried up to a certain order L_M which, depending on the structure and on the size parameters may be as high as 4 or 5. Now for a given L_M one has to calculate, and invert, matrices with complex elements of order $d_M = 2NL_M(L_M + 2)$, N being the number of the spheres in the cluster. Therefore, due to the storage limitations on the computer presently available in Messina, and at CRDC too, it is impossible to handle clusters of more than 5 spheres with $L_M = 5$. This is the maximum order that can be handled by the program PRG1 with a core allowance of 4 Mbytes. This limitation has been overcome by rewriting the program without requiring the storage of the intermediate matrices but requiring the storage of two vectors one for the spherical harmonics and another for the Clebsch-Gordan coefficients. This version of the program named here PRG2, allows us to handle relatively big clusters at the cost of multiplying the CPU time by a factor of 4. A second version of the program, here PRG3, do not require either the storage of the vector C-G coefficients, thus allowing us to handle even big

ster but multiplying the CPU time by a factor of 6 or 7. The capability of the three programs when a core storage of 4 Mbytes is allowed are summarized in Table I.

As can be seen the biggest cluster can be treated only at the cost of neglecting the interactions of order higher than dipole-dipole. In any case this interaction is just that that is commonly included in the calculations of other workers. On the other hand our programs allows us to get information of value on the properties of clusters including as much as 70 spheres. Furthermore these programs allow to treat with great precision the case in which resonances occur, a case in which the multipolar interactions must be included as high to an order as possible.

The formulation and testing of these programs is essentially the work done by F.Borghese, P.Denti and R.Saija during their stay at the CRDC under contract modification P0004.

PRG1

This is the original version of our scattering programs and, as listed, it can handle a cluster of 3 spheres with $L_M=4$. The maximum capability of PRG1 is a cluster of 5 spheres with $L_M=4$. In this case the dimensions of the various matrices and vectors must be carefully checked.

INPUT DESCRIPTION

Refer to DATASET H20TEST001.

CARD 1 (3A4)

DATA JDATA KDATA	}	These quantities identify the DATASET. They can be left blank if desired.
------------------------	---	---

CARD 2 blank

CARD 3 (412)

JGO JWMA IWCSS IWCIP	}	These quantities control the input and output operations of PRG1. Their exact meaning is explained in the comment cards within the programs. Note that if JGO is put equal to 1 for all the groups of data the program runs properly but for that it recomputes matrices whose elements have still valid values.
-------------------------------	---	--

CARD 4 (512)

NSPH	Number of the spheres in the cluster.
LMPO	L_M+1
IBELP	Helicity of the incident wave. Use +1 for right helicity, and -1 for left helicity.
IEXP	This quantity was originally introduced to control the convergence of the multipolar expansions. Set it to 0.
MAXIT	Number of iterations. To be used only when the inverse to the matrix (15) of ref.(2) is to be calculated iteratively.

CARD 5 (3E20.8) (NSPH cards)

$\left. \begin{array}{l} \text{RXX}(1) \\ \text{RYY}(1) \\ \text{RZZ}(1) \end{array} \right\}$ Cartesian coordinates of the centres of the l-th sphere in the cluster.

CARD 6 (4012)

$\text{IOG}(1)$ This index specifies the type of the l-th sphere in the cluster. If $\text{IOG}(l+1)=\text{IOG}(l)$ the program does not recalculate the T-matrices for the l+1-th sphere but take them identical to those of the l-th sphere.

CARD 7 (3E20.8)

$\text{ROS}(1)$ Radius of the l-th sphere.

CARD 8 (2E20.8)

$\text{CRI}(1)$ Complex refractive index of the l-th sphere.

CARD 9 (E20.8,2F10.4)

$\left. \begin{array}{l} \text{VK} \\ \text{THK} \\ \text{PHK} \end{array} \right\}$ Magnitude of the wavevector of the incident wave.
Polar angles (in degrees) of the incident wavevector.

CARD 10 (315)

INVER 0 the T-matrix of the cluster is inverted iteratively.
1 the T-matrix is inverted by LU factorization.
 MODE 0, 1, 2, 3. This parameter provides the equilibration of the T-matrix in four different modes. The value $\text{MODE}=3$ has proved to be the most suitable for dielectric clusters far from resonance.
 NDDMST Maximum dimension of the T-matrix. It must be identical to the dimension of the matrix AM.

CARD 11 (2E20.8)

CI Mixing factor for the iterative inversion of the T-matrix. The value $\text{CI}=0.5$ ensures good convergence.
 TOL Tolerance of the inverted T-matrix. In practice $\|T-T^{-1}\| \leq \text{TOL}$.
These quantities need be specified only when $\text{INVER}=0$

CARD 12 (40A4)

NAME Identifies the output. It can include any alphameric character.

.....1.....2.....3.....4.....5.....6.....7.*.....

NUMBER STATEMENTS = 32, PROGRAM SIZE = 3072 BYTES, PROGRAM NAME = SMAT PA
DIAGNOSTICS GENERATED.
CONTINUATION / *****

[illegible]

SOURCE STATEMENTS = 143, PROGRAM SIZE = 12838 BYTES, PROGRAM NAME = GIGL
NO DIAGNOSTICS GENERATED.
COMPILETIME > *****

[illegible]

```

113MC=113-1
113PC=113+1
1142=1142+M2
1142=N2+1M2
114240=1142-1
1142PC=1142+1
1143=N1+1M2
1143MC=1143-1
1143PC=1143+1
CRM =CCLEB(1,L2,L2 , 1,M2-1)
CR =CCLEB(1,L2,L2 , 0,M2 )
CRP =CCLEB(1,L2,L2 , -1,M2+1)
CRM=CCLEB(1,L2-1,L2, 1,M2-1)
CRM=CCLEB(1,L2-1,L2, 0,M2 )
CRP=CCLEB(1,L2-1,L2,-1,M2+1)
CLCR=CL*CR
C1 = CLCR *G(111 ,112 )
C2 = CLCR *G(113 ,114 )
C3 = CLCR *G(114 ,113 )
C4 = CLCR *G(112 ,111 )
CV1=CC0
CV2=CC0
CV3=CC0
CV4=CC0
IF(CV.EQ.CC) GO TO 15
CLCR=CL*CR
C1 = CLCR *G(1121 ,112 )
C2 = CLCR *G(114 ,113 )
IF(CV.EQ.CC) GO TO 20
CLCR=CL*CR
C1 = CLCR *G(1143 ,114 )
C2 = CLCR *G(1142 ,111 )
IF(CV.EQ.CC) GO TO 25
CLCR=CL*CRM
C1 =C1+ CLCRM *G(111MC,112MC)
C2 =C2+ CLCRM *G(113MC,114MC)
C3 =C3+ CLCRM *G(114MC,113MC)
C4 =C4+ CLCRM *G(112MC,111MC)
IF(CV.EQ.CC) GO TO 30
CLCR=CL*CRP
CV1=CV1+CLCRM*G(111MC,112MC)
CV3=CV3+CLCRM*G(114MC,113MC)
IF(CV.EQ.CC) GO TO 35
CLCR=CL*CRM
C2 =C2+CLCRM*G(113PC,114MC)
C4 =C4+CLCRM*G(1142,111MC)
IF(CV.EQ.CC) GO TO 40
CLCR=CL*CRP
C1 =C1+ CLCRP *G(111PC,112PC)
C2 =C2+ CLCRP *G(113PC,114PC)
C3 =C3+ CLCRP *G(114PC,113PC)
C4 =C4+ CLCRP *G(112PC,111PC)
IF(CV.EQ.CC) GO TO 45
CLCR=CL*CRP
CV1=CV1+CLCRP*G(112PC,112PC)
CV3=CV3+CLCRP*G(114PC,113PC)
IF(CV.EQ.CC) GO TO 50
CLCR=CL*CRP
CV1=CV1+CLCRP*G(113PC,114PC)
CV3=CV3+CLCRP*G(1142PC,111PC)
IF(111,112)=C1
IF(113,114)=C2
IF(114,113)=C3
IF(112,111)=C4
CR(111,112)=CV1*CL
CR(113,114)=CV2*CR
CR(114,113)=CV3*CL
CR(112,111)=CV4*CR
GO CONTINUE
END

```

* SOURCE STATEMENTS = 144, PROGRAM SIZE = 12714 BYTES, PROGRAM NAME = GHCK

* NO DIAGNOSTICS GENERATED.

END COMPILATION 4 *****

..........1.....2.....3.....4.....5.....6.....7.*.....

[illegible]

.....1.....2.....3.....4.....5.....6.....7.....

```
75 20 CONTINUE
76   GP(N1+11, 12)=PI4*SUM1*XILMNI
77   GP(N1+12, 11)=PI4*SUM3*XILMNI
78   GP(N1+11, 12)=PI4*SUM2*XILMNI
79   GP(N1+12, 11)=PI4*SUM4*XILMNI
80 30 CONTINUE
81   GC TC 40
82 32 DO 35 I=1,NLM
83   API=N1+I
84   DO 35 J=1,NLM
85   GP(API,J)=CCC
86 35 GP(API,J)=CCO
87 40 CONTINUE
88 RETURN
89 END
```

CS* SOURCE STATEMENTS = 88, PROGRAM SIZE = 9478 BYTES, PROGRAM NAME = GJMT

PI

CS* NO DIAGNOSTICS GENERATED.

CS* COMPILATION 3 *****

OBJECT FIXED NO
 CPT(1) LANGLEVEL(77) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....1.....2.....3.....4.....5.....6.....7......

```

1  SUBROUTINE GUMI
2  (LMPC,NSPH,VK)
3  IMPLICIT REAL*8(A-H,C-Z)
4  DIMENSION YLM( 81),FJ(100)
5  COMMON/DUMC/ RXX(4),RYY(4),RZZ(4),
6  IRCS(4),CRI(4),XIL(4),
7  2XILI(4),RM(3,4),SM(3,4),TSAS(2,2),SAC(2,2),
8  3*(15,2),A1(120),AF(120),AMMO(15),AEMO(15),S(15),NAME(40),IUG(4)
9  COMMON/DUM3/GM(64,16),GP(64,16)
10 COMMON/DUM6/FACT(30),FNCHM(28)
11 COMPLEX*16 YLM,XIL,XILI,GM,GP,XILMN,XILMNI,SUM1,SUM2,SUM3,SUM4,
12 1XILTI,XILT,AUC1,AUC2,CCO,w,A1,AF,AMMO,AEMO,S,RM,SM,CRI,TSAS,SAC
13 DATA P14/ 12.566370614356/
14 JCK=90
15 CCO=0.000
16 CCO=(0.000,0.000)
17 NLM=LMPC*LMPC
18 LMTPO=LMPC+LMPC-1
19 LMI=LMTPO-1
20 NI=-NLM
21 DO 40 IF=1,NSPH
22 NI=NI+NLM
23 RX=-RXX(IF)
24 RY=-RYY(IF)
25 RZ=-RZZ(IF)
26 IF(RX.EQ.0.0.AND.RY.EQ.0.0.AND.RZ.EQ.0.0) GO TO 32
27 CALL PLLA(RX,RY,RZ,RK,CRTH,SRTH,CRPH,SRPH)
28 CALL SPHAX(CRTH,SRTH,CRPH,SRPH,LMTPO,YLM)
29 ANG=RX*VK
30 CALL RSP(ANG, LMI,JCK,FJ)
31 DO 30 LF=1,LMPC
32 LI=LF-1
33 IL1=LF*LI+1
34 M1=LF+LI
35 M1=-LI
36 DO 30 MF=1,M1
37 M1=M1+1
38 I1=IL1+M1
39 DO 30 LS=LF,LMPC
40 L2=LS-1
41 IL2=LS*L2+1
42 M2=-L2
43 IF(L2.EQ.L1)*M2=M1
44 LVAAPC=L3+L1
45 LMINP=L3-L1
46 XILMNI=XILI(LMINP)
47 XILMNI=XILI(LMINP)
48 M3=LS-M2
49 L2=L3+L2
50 M2=-L2
51 DO 30 MS=1,M3
52 M3=M3+1
53 I2=L2+M2
54 DO 30 M2=1,M2
55 M2=M2+1
56 I3=L2+M2
57 DO 30 M2=1,M2
58 M2=M2+1
59 I4=L2+M2
60 DO 30 M2=1,M2
61 M2=M2+1
62 I5=L2+M2
63 XILTI=-XILMNI
64 XILT=-XILMNI
65 DO 30 LT=LMI+1,LVAAPC,2
66 XILTI=-XILTI
67 XILT=-XILT
68 L1=L1-1
69 M1=M1-2
70 M2=DOLOC(L2,L3,L1,M2,M3)
71 IF(CCO.EQ.0.0) GO TO 20
72 N=LI+L3+2*1
73 IF(CABS(YLM(K)).LT.1.0E-8) GO TO 20
74 M1=LI+L3
75 X=XIL
76 C=DOLOC(LMI+1,X)/(PI+MFM)*CC*DOLOC(L2,L3,L1,0,0)
77 FJ=FJ(LT)*X
78 AUC1=C*DOLOC(NJ(YLM(K))
79 AUC2=C*YLM(K)
80 SUM1=SUM1+AUC1*XILTI
81 SUM2=SUM2+AUC2*XILTI
82 SUM3=SUM3+AUC1*XILT
83 SUM4=SUM4+AUC2*XILT

```

.....1.....2.....3.....4.....5.....6.....7.....

```

74      X=MIM
75      X=DSQRT((L2I*X)/(PI4*MFM))*CG*DCLEB(L2,L3,L1,0,0)
76      FH=DC4PLX(FJ(LT),FN(LT))*X
77      AUC1=FF*DCUNJG(YLM(K))
78      AUC2=FF*YLM(K)
79      SUM1=SUM1+AUC1*XILT1
80      SUM2=SUM2+AUC1*XILT1
81      SUM3=SUM3+AUC2*XILT1
82      SUM4=SUM4+AUC2*XILT1
83      20 CONTINUE
84      G(N1+11,N2+12)=PI4*SUM1*XILMNI
85      G(N1+12,N2+11)=PI4*SUM3*XILMN
86      G(N2+11,N1+12)=PI4*SUM2*XILMNI
87      G(N2+12,N1+11)=PI4*SUM4*XILMN
88      30 CONTINUE
89      RETURN
90      END

```

CS* SOURCE STATEMENTS = 89, PROGRAM SIZE = 9850 BYTES, PROGRAM NAME = GHMT PJ

CS* NO DIAGNOSTICS GENERATED.

CS* COMPILATION 2 *****

EFFECT NOCTIST NCMAP NOXREF NOGOSTMT NODECK SOURCE TERM OBJECT FIXED NO
 OPT(1) LANGLEVL(77) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....1.....2.....3.....4.....5.....6.....7.....

```

1  SUBROUTINE GHMT
2    (LMPC,NSPH,VK)
3    IMPLICIT REAL*8(A-H,O-Z)
4    DIMENSION FJ(100),FN( 9),
5    1YLM( 81)
6    CCMCGN/DJMO/ RXX(4),RYY(4),RZZ(4),
7    1ROS(4),CRI(4),XIL(4),
8    2XIL1(4),RM(3,4),SM(3,4),TSAS(2,2),SAC(2,2),
9    3W(15,2),AI(120),AF(120),AMMO(15),AEMO(15),S(15),NAME(40),IOG(4)
10   COMMON/DUM1/G(64,64)
11   COMMON/DUM6/FACTO(30),FNCRM(28)
12   CCMPLX*16 G,XIL,XIL1,YLM,XILMN,XILMNI,SUM1,SUM2,SUM3,SUM4,
13   1XILT,XILTI,FH,AUC1,AUC2,CCO,RM,SM,W,AI,AF,AMMO,AEMO,S,CRI,TSAS,SAC
14   DATA PI4/ 12.566370614356/
15   JCK=90
16   CCC=(0.000,0.000)
17   NLM=LMPC*LMPC
18   N=NSPH*NLM
19   LMTPC=LMPC+LMPC-1
20   LMT=LMTPC-1
21   DO 10 NF=1,N
22   DO 10 NS=1,N
23   10 G(NF,NS)=CCC
24   NSMC=NSPH-1
25   N1=-NLM
26   DO 30 NF=1,NSMC
27   N1=N1+NLM
28   A2=(NF-1)*NLM
29   NFPU=NF+1
30   DO 30 NS=NFPC,NSPH
31   A2=A2+NLM
32   RX=RX(NF)-RXX(NF)
33   RY=RY(NF)-RYY(NF)
34   RZ=RZ(NF)-RZZ(NF)
35   CALL POLAR(RX,RY,RZ,RR,CRTH,SRTH,CRPH,SRPH)
36   CALL SPHAR(CRTH,SRTH,CRPH,SRPH,LMTPO,YLM)
37   ARG=RR*VK
38   CALL RBF(ARG, LMT,JCK,FJ)
39   CALL RNF(ARG, LMT,FN)
40   DO 30 LF=1,LMPD
41   L1=LF-1
42   IL1=LF*L1+1
43   MF4=LF+L1
44   M1=-LF
45   DO 30 MF=1,MFM
46   M1=M1+1
47   I1=IL1+M1
48   DO 30 LS=LF,LMPD
49   L2=LS-1
50   IL2=LS*L2+1
51   L2=-L2
52   IF (L2.EQ.L1) ML=M1
53   LMAXPC=LS+L1
54   LMINPC=LS-L1
55   XILMN=XIL(LMINPC)
56   XILMNI=XIL1(LMINPC)
57   MS4=LS-ML
58   L2T=LS+L2
59   M2=ML-1
60   DO 30 MS=1,MSM
61   M2=M2+1
62   I2=IL2+M2
63   SUM1=CCO
64   SUM2=CCO
65   SUM3=CCO
66   SUM4=CCO
67   XILT=-XILMN
68   XILTI=-XILMNI
69   DO 20 LT=LMINPC,LMAXPC,2
70   XILT=-XILT
71   XILTI=-XILTI
72   L3=LT-1
73   M3=M1-M2
74   CG=DCLEB(L2,L3,L1,M2,M3)
75   IF(CG.EQ.0.000) GO TO 20
76   K=LT+L3+M3+1
77   IF(CDABS(YLM(K)).LT.1.00-8) GO TO 20
78   MTM=LT+L3
  
```


REPORT NO. - DTSUTIL I C C F L I B R A R Y F I L E M A I N T E N A N C E
 1...5...10...15...20...25...30...35...40...45...50...55...60...65...70...75...

```

      WRITE(IW,6050)(S(I),I=IINR,IFNR)
      IF(IFNR.EQ.NLMM) GO TO 328
      IINR=IFNR+1
      IFNR=IFNR+4
      GO TO 325
328  IF(JJ.EQ.1) GO TO 350
      JJ=1
      WRITE(IW,6060)
      IF(JIN.EQ.1) GO TO 335
      DO 330 I=1,NLMM
330  S(I)=AEMC(I)
      GO TO 285
335  DO 340 I=1,NLMM
      II=I+IN
340  S(II)=AF(II+NM)
      GO TO 285
350  IN=IN+NLMM
355  WRITE(IW,6080)
      IF(JIN.EQ.NSPH) GO TO 370
360  JIN=NSPH
      GO TO 260
370  SCARAT=SCASEC/GCS
      IF(ICRI.NE.0) GO TO 380
      ABSRAT=1.000
      GO TO 385
380  ABSRAT=ABSSEC/GCS
385  TOTRAT=TOTSEC/TCS
      SCA=SCASEC/GCS
      ABS=ABSSEC/GCS
      TOT=TOTSEC/GCS
      IF(NHELP.EQ.1) TSAS(ISA,ISA)=TSAS(JSA,JSA)
      REFINR=DREAL(SAC(ISA,ISA))/DREAL(TSAS(ISA,ISA))
      ABSCLR=DIMAG(SAC(ISA,ISA))/DIMAG(TSAS(ISA,ISA))
      WRITE(IW,6100)SCASEC,ABSSEC,TOTSEC
      WRITE(IW,6300)SCARAT,ABSRAT,TOTRAT
      WRITE(IW,6400)SCA,ABS,TOT
      WRITE(IW,6700)ISA,ISA,SAC(ISA,ISA),JSA,ISA,SAC(JSA,ISA)
      WRITE(IW,6800)ISA,ISA,REFINR,ISA,ISA,ABSCOR
      IF(NHELP.NE.1) GO TO 100
      REIAT=(DREAL(SAC(JSA,JSA))-DREAL(SAC(ISA,ISA)))/DREAL(SAC(JSA,JSA
      I))
      ROCIAT=(DIMAG(SAC(JSA,JSA))-DIMAG(SAC(ISA,ISA)))/DIMAG(SAC(JSA,JSA
      I))
      WRITE(IW,6900)JSA,ISA,REFINR,JSA,ISA,FOICHR
      GO TO 100
400  READ(IF,5000)
      GO TO 400
500  STOP
      END
*END PRINT                    239 RECORDS

```

```

      IF(IWCSS.EQ.1) WRITE(IW,6700)
115  ISA,ISA,TSAS(ISA,ISA),JSA,ISA,TSAS(JSA,ISA)
142  CALL SZCT(LMPO,NSPH,IHELP,IEXP,VK,THK,PHK)
      IF(INVER.NE.0) GO TO 200
      IF(IWCIP.NE.1) GO TO 143
      WRITE(IW,6000)NAME
      WRITE(IW,6500)TCL,MAXIT,CI
143  ITER=-1
      DO 145 K=1,NDIM
145  AI(K)=BV(K)
      GO TO 170
150  DO 160 K=1,NDIM
160  AI(K)=AI(K)*CI+AF(K)*CF
170  DO 190 I=1,NDIM
      DET=BV(I)
      DO 180 J=1,NDIM
      AMR=DREAL(AM(I,J))
      AMI=DIMAG(AM(I,J))
      AIR=DREAL(AI(J))
      AII=DIMAG(AI(J))
      IF(DABS(AMR).LT.1.D-36)AMR=0.000
      IF(DABS(AMI).LT.1.D-36)AMI=0.000
      IF(DABS(AIR).LT.1.D-36)AIR=0.000
      IF(DABS(AII).LT.1.D-36)AII=0.000
      AM(I,J)=DCMPLX(AMR,AMI)
      AI(J)=DCMPLX(AIR,AII)
180  DET=DET-AM(I,J)*AI(J)
      DET=DREAL(DET)
      DETI=DIMAG(DET)
      IF(DABS(DETR).LT.1.D-36)DETR=0.000
      IF(DABS(DETI).LT.1.D-36)DETI=0.000
      DET=DCMPLX(DETR,DETI)
190  AFI(I)=DET
      ITER=ITER+1
      IF(ITER.NE.0) DLSEC=SEC
      CALL CUSSEC(LMPO,NSPH,VK,IHELP,SCASEC,ABSSEC,TOTSEC)
      SEC=DLSEC
      IF(ITER.EQ.1) GO TO 150
      DELTA=DLSEC/SEC-1.000
      IF(IWCIP.EQ.1)WRITE(IW,6600)ITER,DLSEC,SEC,DELTA
      IF(DABS(DELTA).LT.FCL)GO TO 230
      IF(ITER.LT.MAXIT)GO TO 150
      IF(ITER.EQ.4) CALL SMAT(LMPO,NSPH)
      DO 200 I=1,NDIM
200  AM(I,1)=AM(I,1)+1.000
      CALL CSHIV(AA,V,NDIMST,NDIM,MODE,IER)
      IF(IER.NE.1) GO TO 400
      DO 210 I=1,NDIM
210  BV(I)=0.000
      DO 220 J=1,NDIM
220  BV(J)=BV(J)+BV(I)
      CALL CUSSEC(LMPO,NSPH,VK,IHELP,SCASEC,ABSSEC,TOTSEC)
      DLSEC=DLSEC+ABSSEC
      IF(IW.NE.1)WRITE(IW,6100)NAME
      IF(IW.NE.1)WRITE(IW,6200)
230  JIN=1
240  DO 260 J=JIN,NSPH
260  JJ=J
      IF(JIN.EQ.1) GO TO 275
      DO 270 I=1,NDIM
270  S(I)=A140(I)
      GO TO 260
275  DO 280 I=1,NDIM
280  II=1+I
      A(I)=A(II)
      IF(IW.NE.1)WRITE(IW,6300)
      IF(JIN.EQ.1) GO TO 290
      IF(IW.NE.1)WRITE(IW,6400)
      GO TO 275
      IF(IW.NE.1)WRITE(IW,6500)
      IF(IW.NE.1)WRITE(IW,6600)
      IF(JIN.EQ.1) GO TO 310
      IF(IW.NE.1)WRITE(IW,6700)
      GO TO 275
      IF(IW.NE.1)WRITE(IW,6800)
      IF(IW.NE.1)WRITE(IW,6900)
      IF(IW.NE.1)WRITE(IW,7000)
      IF(IW.NE.1)WRITE(IW,7100)
      IF(IW.NE.1)WRITE(IW,7200)
      IF(IW.NE.1)WRITE(IW,7300)
      IF(IW.NE.1)WRITE(IW,7400)
      IF(IW.NE.1)WRITE(IW,7500)
      IF(IW.NE.1)WRITE(IW,7600)
      IF(IW.NE.1)WRITE(IW,7700)
      IF(IW.NE.1)WRITE(IW,7800)
      IF(IW.NE.1)WRITE(IW,7900)
      IF(IW.NE.1)WRITE(IW,8000)
      IF(IW.NE.1)WRITE(IW,8100)
      IF(IW.NE.1)WRITE(IW,8200)
      IF(IW.NE.1)WRITE(IW,8300)
      IF(IW.NE.1)WRITE(IW,8400)
      IF(IW.NE.1)WRITE(IW,8500)
      IF(IW.NE.1)WRITE(IW,8600)
      IF(IW.NE.1)WRITE(IW,8700)
      IF(IW.NE.1)WRITE(IW,8800)
      IF(IW.NE.1)WRITE(IW,8900)
      IF(IW.NE.1)WRITE(IW,9000)
      IF(IW.NE.1)WRITE(IW,9100)
      IF(IW.NE.1)WRITE(IW,9200)
      IF(IW.NE.1)WRITE(IW,9300)
      IF(IW.NE.1)WRITE(IW,9400)
      IF(IW.NE.1)WRITE(IW,9500)
      IF(IW.NE.1)WRITE(IW,9600)
      IF(IW.NE.1)WRITE(IW,9700)
      IF(IW.NE.1)WRITE(IW,9800)
      IF(IW.NE.1)WRITE(IW,9900)
      IF(IW.NE.1)WRITE(IW,10000)

```

140 00511525

```

CCCCCCCCCCCCCCCCCCCCCCPRG1CCCCCCCCCCCCCCCCCCCC

```

[illegible][illegible]

IF INSTEAD OF ONE MULTIPOLE EXPANSION COEFFICIENT IS WRITTEN
IF INSTEAD OF TWO MULTIPOLE EXPANSION COEFFICIENTS
ARE ALSO WRITTEN.
IF INSTEAD OF TWO SECTIONS OF THE SINGLE SPHERES ARE WRITTEN.
IF INSTEAD DATA ABOUT CONVERGENCE OF ITERATIVE
PROCEDURE ARE WRITTEN.

```

1F(JJ,0.5F(4),,1,1,50)
  LEAD(1,0.50)TSPH,EMP,THELP,LEXP,MAXIT
  DO(1,0.50)OAX(1),OYY(1),OZZ(1),I=1,NSPH)
  LEAD(1,0.50)O(1),I=1,NSPH)
  LEAD(1,0.50)EUS(1),I=1,NSPH)
  LEAD(1,0.50)ORI(1),I=1,NSPH)
  LEAD(1,0.50)VK,THK,PHK
  LEAD(1,0.50)INVK,MODE,NORMST
  LEAD(1,0.50)C(1,1)

```

..........1.....2.....3.....4.....5.....6.....7.*.....:

COMPLAINTS *****

10/10/54

VS FORNAT

DATE 1954 NOV 37

TIME 17 40 00

OBJECT NAME: NCPM ACARD NCPM SIM NODE:K SOURCE TERM OBJECT FIXED NOT
 PT(1) LARGLEV(77) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....1.....2.....3.....4.....5.....6.....7.....

```

1  SUBROUTINE WLM
2  1(KHELP,TH,PH,LMPG)
3  IMPLICIT REAL*8(A-H,I-Z)
4  DIMENSION YLM(81)
5  COMMON/DJ40/ RXX(4),RYY(4),RZZ(4),
6  IRGS(4),CRI(4),XIL(4),
7  2AILI(4),RM(3,4),SM(3,4),TSAS(2,2),SAC(2,2),
8  3A(15,2),AI(120),AF(120),AMMO(15),AEMO(15),S(15),NAME(40),IOG(4)
9  COMMON/DUM6/FACTC(30),FNCKM(28)
10 COMPLEX*16 YLM,XIL,w,AP,AM,AZ,CL,XILI,CRI,AI,AF,AMMO,AEMO,S,
11 IRM,SM,TSAS,SAC
12 DATA PI4/ 12.566370614356/
13 LMP=LMPG*LMPG+1
14 YLA(LMP)=(C.CDO,C.CDO)
15 IHELP=1
16 IF(KHELP.EQ.2) IHELP=-1
17 P=-IHELP
18 CUST=CCOS(TH)
19 SINT=SSIN(TH)
20 CCSP=CCOS(PH)
21 SINP=SSIN(PH)
22 CALL SPHAR(CUST,SINT,CCSP,SINP,LMPG,YLM)
23 ALPHA=-CUST*CCSP
24 BETA=-CUST*SINP
25 XIL=XILI
26 ALPHA=-SINT
27 BETA=-CCSP
28 AZ=SSIN(S)
29 A1=-.5*(COMPLEX(ALPHA1,P*ALPHA2)+COMPLEX(BETA1,P*BETA2)*(0.000,1.000))
30 A2=-.5*(COMPLEX(ALPHA1,P*ALPHA2)-COMPLEX(BETA1,P*BETA2)*(0.000,1.000))
31 A3=COMPLEX(CAY1,P*CAM2)
32 C=20 LF=2,L*PI
33 C=LF-1
34 LFIL=LF+C
35 XALFIL
36 C=P1+XIL(LI)/DSQRT(X)
37 Y=C*LF
38 Y=-LI
39 C=20 MF=1,MV
40 M=1+1
41 X=LFIL+M
42 X=LFIL-M*(Y+1)
43 CP=DSQRT(X)
44 X=LFIL-M*(Y-1)
45 CM=DSQRT(X)
46 Y=M
47 C=(S,XHELP)=COMPOS(AM*CP*YLM(K+2)+AP*CM*YLM(K)+AZ*CL*YLM(K+1))*CL
48 RETURN
49 END

```

NUMBER OF STATEMENTS = 44, PROGRAM SIZE = 6044 BYTES, PROGRAM NAME = WLM

PA

NO. OF STUDIOS GENERATED.

...#...1.....2.....3.....4.....5.....6.....7....:

[illegible]

....1.....2.....3.....4.....5.....6.....7.*...

```

1 SUBROUTINE AUXIL
2 1(LMPC)
3 IMPLICIT REAL*8(A-F,C-Z)
4 COMMON/DUM0/ RXX(4),RYY(4),KZZ(4),
5 IRCS(4),CRI(4),XIL(4),
6 2XIL1(4),RM(3,4),SM(3,4),TSAS(2,2),SAC(2,2),
7 3w(15,2),AI(120),AF(120),AMMO(15),AEMO(15),S(15),NAME(40),IOG(4)
8 COMMON/DUM6/FACFC(30),FNCKM(28)
9 COMPLEX*16 XIL,XIL1,CRI,RM,SM,w,AI,AF,AMMO,AEMO,S,TSAS,SAC
10 DATA PI4/ 12.566370614356/
11 NFAC=30
12 FACFC(1)=1.000
13 DO 1 I=2,NFAC
14 A=I-1
15 FACFC(I)=A*FACFC(I-1)
16 LMTPC=LMPC+LMPC-1
17 DO 5 LF=1,LMTPC
18 L=LF-1
19 LTPC=LF+L
20 DO 6 LY=1,L
21 A=1+1
22 L=LF-1
23 LY=LF+LY
24 DO 7 X=1,L+LY
25 F=1+3*FACFC(LY)/FACFC(LY)
26 W=X/PI,
27 F*W(X)=DS(X*F)
28 I=1
29 I=I+1
30 XIL1(I)=1
31 XIL(I)=1
32 IF(1.EQ.LMPC) GO TO 15
33 I=I+1
34 XIL1(I)=(0.000,-1.000)
35 XIL(I)=(0.000, 1.000)
36 IF(1.EQ.LMPC) GO TO 15
37 I=I+1
38 XIL1(I)=-1
39 XIL(I)=-1
40 IF(1.EQ.LMPC) GO TO 15
41 I=I+1
42 XIL1(I)=(0.000, 1.000)
43 XIL(I)=(0.000,-1.000)
44 IF(1.LT.LMPC) GO TO 12
45 RETURN
46 END

```

STATEMENTS = 42, PROGRAM SIZE = 2888 BYTES, PROGRAM NAME = AUXIL

ANALYTICAL RESULTS.

```

1  FUNCTION SCLEB(JA,JB,JC,MA,MB)
2  IMPLICIT REAL*8(A-H,C-Z)
3  COMMON/COMMON/FAC1(30),FNCRN(28)
4  MC=MA+MB
5  IF(MA-JA)4,4,3
6  SCLEB=0.00
7  GO TO 35
8  IF(MA+JA)5,6,6
9  SCLEB=0.00
10 SCLEB=0.00
11 GO TO 35
12 IF(MB-JB)8,8,7
13 SCLEB=0.00
14 GO TO 35
15 IF(MB+JB)9,10,10
16 SCLEB=0.00
17 GO TO 35
18 IF(MC-JC)12,12,11
19 SCLEB=0.00
20 GO TO 35
21 IF(MC+JC)13,14,14
22 SCLEB=0.00
23 GO TO 35
24 IF(MA-JA-MB+JB)15,16,15
25 SCLEB=0.00
26 GO TO 35
27 IF(MA+JA-MB+JB)17,17,20
28 IF(MB+JB-MC+JC)18,18,19
29 K=0
30 GO TO 24
31 K=JB18
32 GO TO 24
33 IF(MB+JB-MC+JC)21,21,22
34 K=JB17
35 GO TO 24
36 IF(MB+JB-MC+JC)19,19,21
37 IF(MB+JB-MC+JC)20,20,22
38 IF(MB+JB-MC+JC)22,22,27
39 K=JB21
40 GO TO 24
41 IF(MB+JB-MC+JC)23,23,23
42 IF(MB+JB-MC+JC)24,24,24
43 IF(MB+JB-MC+JC)25,25,25
44 IF(MB+JB-MC+JC)26,26,26
45 IF(MB+JB-MC+JC)27,27,27
46 IF(MB+JB-MC+JC)28,28,28
47 IF(MB+JB-MC+JC)29,29,29
48 IF(MB+JB-MC+JC)30,30,30
49 IF(MB+JB-MC+JC)31,31,31
50 IF(MB+JB-MC+JC)32,32,32
51 IF(MB+JB-MC+JC)33,33,33
52 IF(MB+JB-MC+JC)34,34,34
53 IF(MB+JB-MC+JC)35,35,35
54 IF(MB+JB-MC+JC)36,36,36
55 IF(MB+JB-MC+JC)37,37,37
56 IF(MB+JB-MC+JC)38,38,38
57 IF(MB+JB-MC+JC)39,39,39
58 IF(MB+JB-MC+JC)40,40,40
59 IF(MB+JB-MC+JC)41,41,41
60 IF(MB+JB-MC+JC)42,42,42
61 IF(MB+JB-MC+JC)43,43,43
62 IF(MB+JB-MC+JC)44,44,44
63 IF(MB+JB-MC+JC)45,45,45
64 IF(MB+JB-MC+JC)46,46,46
65 IF(MB+JB-MC+JC)47,47,47
66 IF(MB+JB-MC+JC)48,48,48
67 IF(MB+JB-MC+JC)49,49,49
68 IF(MB+JB-MC+JC)50,50,50
69 IF(MB+JB-MC+JC)51,51,51
70 IF(MB+JB-MC+JC)52,52,52
71 IF(MB+JB-MC+JC)53,53,53
72 IF(MB+JB-MC+JC)54,54,54
73 IF(MB+JB-MC+JC)55,55,55
74 IF(MB+JB-MC+JC)56,56,56
75 IF(MB+JB-MC+JC)57,57,57
76 IF(MB+JB-MC+JC)58,58,58
77 IF(MB+JB-MC+JC)59,59,59
78 IF(MB+JB-MC+JC)60,60,60
79 IF(MB+JB-MC+JC)61,61,61
80 IF(MB+JB-MC+JC)62,62,62
81 IF(MB+JB-MC+JC)63,63,63
82 IF(MB+JB-MC+JC)64,64,64
83 IF(MB+JB-MC+JC)65,65,65
84 IF(MB+JB-MC+JC)66,66,66
85 IF(MB+JB-MC+JC)67,67,67
86 IF(MB+JB-MC+JC)68,68,68
87 IF(MB+JB-MC+JC)69,69,69
88 IF(MB+JB-MC+JC)70,70,70
89 IF(MB+JB-MC+JC)71,71,71
90 IF(MB+JB-MC+JC)72,72,72
91 IF(MB+JB-MC+JC)73,73,73
92 IF(MB+JB-MC+JC)74,74,74
93 IF(MB+JB-MC+JC)75,75,75
94 IF(MB+JB-MC+JC)76,76,76
95 IF(MB+JB-MC+JC)77,77,77
96 IF(MB+JB-MC+JC)78,78,78
97 IF(MB+JB-MC+JC)79,79,79
98 IF(MB+JB-MC+JC)80,80,80
99 IF(MB+JB-MC+JC)81,81,81
100 IF(MB+JB-MC+JC)82,82,82
101 IF(MB+JB-MC+JC)83,83,83
102 IF(MB+JB-MC+JC)84,84,84
103 IF(MB+JB-MC+JC)85,85,85
104 IF(MB+JB-MC+JC)86,86,86
105 IF(MB+JB-MC+JC)87,87,87
106 IF(MB+JB-MC+JC)88,88,88
107 IF(MB+JB-MC+JC)89,89,89
108 IF(MB+JB-MC+JC)90,90,90
109 IF(MB+JB-MC+JC)91,91,91
110 IF(MB+JB-MC+JC)92,92,92
111 IF(MB+JB-MC+JC)93,93,93
112 IF(MB+JB-MC+JC)94,94,94
113 IF(MB+JB-MC+JC)95,95,95
114 IF(MB+JB-MC+JC)96,96,96
115 IF(MB+JB-MC+JC)97,97,97
116 IF(MB+JB-MC+JC)98,98,98
117 IF(MB+JB-MC+JC)99,99,99
118 IF(MB+JB-MC+JC)100,100,100
119 IF(MB+JB-MC+JC)101,101,101
120 IF(MB+JB-MC+JC)102,102,102
121 IF(MB+JB-MC+JC)103,103,103
122 IF(MB+JB-MC+JC)104,104,104
123 IF(MB+JB-MC+JC)105,105,105
124 IF(MB+JB-MC+JC)106,106,106
125 IF(MB+JB-MC+JC)107,107,107
126 IF(MB+JB-MC+JC)108,108,108
127 IF(MB+JB-MC+JC)109,109,109
128 IF(MB+JB-MC+JC)110,110,110
129 IF(MB+JB-MC+JC)111,111,111
130 IF(MB+JB-MC+JC)112,112,112
131 IF(MB+JB-MC+JC)113,113,113
132 IF(MB+JB-MC+JC)114,114,114
133 IF(MB+JB-MC+JC)115,115,115
134 IF(MB+JB-MC+JC)116,116,116
135 IF(MB+JB-MC+JC)117,117,117
136 IF(MB+JB-MC+JC)118,118,118
137 IF(MB+JB-MC+JC)119,119,119
138 IF(MB+JB-MC+JC)120,120,120
139 IF(MB+JB-MC+JC)121,121,121
140 IF(MB+JB-MC+JC)122,122,122
141 IF(MB+JB-MC+JC)123,123,123
142 IF(MB+JB-MC+JC)124,124,124
143 IF(MB+JB-MC+JC)125,125,125
144 IF(MB+JB-MC+JC)126,126,126
145 IF(MB+JB-MC+JC)127,127,127
146 IF(MB+JB-MC+JC)128,128,128
147 IF(MB+JB-MC+JC)129,129,129
148 IF(MB+JB-MC+JC)130,130,130
149 IF(MB+JB-MC+JC)131,131,131
150 IF(MB+JB-MC+JC)132,132,132
151 IF(MB+JB-MC+JC)133,133,133
152 IF(MB+JB-MC+JC)134,134,134
153 IF(MB+JB-MC+JC)135,135,135
154 IF(MB+JB-MC+JC)136,136,136
155 IF(MB+JB-MC+JC)137,137,137
156 IF(MB+JB-MC+JC)138,138,138
157 IF(MB+JB-MC+JC)139,139,139
158 IF(MB+JB-MC+JC)140,140,140
159 IF(MB+JB-MC+JC)141,141,141
160 IF(MB+JB-MC+JC)142,142,142
161 IF(MB+JB-MC+JC)143,143,143
162 IF(MB+JB-MC+JC)144,144,144
163 IF(MB+JB-MC+JC)145,145,145
164 IF(MB+JB-MC+JC)146,146,146
165 IF(MB+JB-MC+JC)147,147,147
166 IF(MB+JB-MC+JC)148,148,148
167 IF(MB+JB-MC+JC)149,149,149
168 IF(MB+JB-MC+JC)150,150,150
169 IF(MB+JB-MC+JC)151,151,151
170 IF(MB+JB-MC+JC)152,152,152
171 IF(MB+JB-MC+JC)153,153,153
172 IF(MB+JB-MC+JC)154,154,154
173 IF(MB+JB-MC+JC)155,155,155
174 IF(MB+JB-MC+JC)156,156,156
175 IF(MB+JB-MC+JC)157,157,157
176 IF(MB+JB-MC+JC)158,158,158
177 IF(MB+JB-MC+JC)159,159,159
178 IF(MB+JB-MC+JC)160,160,160
179 IF(MB+JB-MC+JC)161,161,161
180 IF(MB+JB-MC+JC)162,162,162
181 IF(MB+JB-MC+JC)163,163,163
182 IF(MB+JB-MC+JC)164,164,164
183 IF(MB+JB-MC+JC)165,165,165
184 IF(MB+JB-MC+JC)166,166,166
185 IF(MB+JB-MC+JC)167,167,167
186 IF(MB+JB-MC+JC)168,168,168
187 IF(MB+JB-MC+JC)169,169,169
188 IF(MB+JB-MC+JC)170,170,170
189 IF(MB+JB-MC+JC)171,171,171
190 IF(MB+JB-MC+JC)172,172,172
191 IF(MB+JB-MC+JC)173,173,173
192 IF(MB+JB-MC+JC)174,174,174
193 IF(MB+JB-MC+JC)175,175,175
194 IF(MB+JB-MC+JC)176,176,176
195 IF(MB+JB-MC+JC)177,177,177
196 IF
```

```

70      SQUA 1=ARG*FACTC (JJ1)*FACTC (JJ2)*FACTC (JJ3)
71      SQUA 2=FACTC (JJ4)
72      SQUA 3=FACTC (JJ5)*FACTC (JJ6)*FACTC (JJ7)
73      1*FACTC (JJ8)*FACTC (JJ9)*FACTC (JJ10)
74      SQUA 4=SQUA 1*SQUA 3/SQUA 2
75      DCLEB=SUM*DSQRT(SQUA 4)
76      RETURN
77      END

```

CS* SOURCE STATEMENTS = 84, PROGRAM SIZE = 4774 BYTES, PROGRAM NAME = DCLEB

CS* NO DIAGNOSTICS GENERATED.

CS* COMPILATION 12 *****

.....1.....2.....3.....4.....5.....6.....7......

```

1  SUBROUTINE RBF(X,N,JCK,FJ)
2  IMPLICIT REAL*8(A-H,O-Z)
3  DIMENSION FJ(100)
4  ICK=JCK
5  IF(X-1.E-8)7,11,11
6  7 FJ(1)=1.
7  IF( )10,10,8
8  8 MM=N+1
9  DO 9 M=2,MM
10 FJ(M)=0.
11 DO 10 IC 50
12 FNC=1.04*X+6.5
13 TST=4.21*.43429+4815*DLOG(X)+3.
14 IF(2.-TST)13,12,12
15 12 DELTA=2.
16 DO 13 IC 14
17 DELTA=TST
18 IF( )
19 IF(FN-FNC)15,15,16
20 F=FNC+DELTA
21 DO 16 IC 17
22 F=F+DELTA
23 F=F+1.
24 IF( )
25 IF( )
26 IF( )
27 IF( )
28 IF( )
29 IF( )
30 IF( )
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81 IF( )
82 IF( )
83 IF( )
84 IF( )
85 IF( )

```

**1234567.*

01 UNCLASSIFIED, 14 * * * * *

.....1.....2.....3.....4.....5.....6.....7......

```

SUBROUTINE POLAR(X,Y,Z,R,CTH,STH,CPH,SPH)
IMPLICIT REAL*8(A-H,C-Z)
RHO=X*X+Y*Y
IF(RHO.GT.0.000) GO TO 10
CPH=1.000
SPH=0.000
K=DA35(Z)
IF(K.GT.0.000) GO TO 15
CTH=1.000
STH=0.000
RETURN
10 K=DSQRT(RHO+Z*Z)
RHO=DSQRT(RHO)
CPH=X/RHO
SPH=Y/RHO
15 CTH=Z/K
STH=RHO/K
RETURN
END
    
```

END OF STATEMENTS - 15, PROGRAM SIZE = 1178 BYTES, PROGRAM NAME = POLAR

END OF STATEMENTS - 15, PROGRAM SIZE = 1178 BYTES, PROGRAM NAME = POLAR

END OF STATEMENTS - 15, PROGRAM SIZE = 1178 BYTES, PROGRAM NAME = POLAR


```

10 PLMRS(J)=(C*X+PLMRS(K)-C*PLMRS(M))/A
11 IF(L-LV)30,31,31
12 L=L+1
13 DO T=2,
14 L=3
15 J=(L+(L+1))/2+2
16 K=L-1
17 S=2*L-1
18 C=L
19 K=J-L
20 M=J-2*L+1
21 PLMRS(J)=(S*K+PLMRS(K)-C*PLMRS(M))/A
22 IF(L-L4)33,34,34
23 L=L+1
24 DO T=32,
25 L=2
26 M=1
27 LAVE=(L*(L+1))/2+1
28 J=LAVE+4+1
29 K=J-1
30 K=K-1
31 LAVE=1
32 Y=(C*J*(J+1)*X)/Y
33 Y=Y*(J*(J+1))
34 PLMRS(J)=A*PLMRS(K)-Y*PLMRS(N)
35 Y=Y*(J*(J+1))
36
37
38
39
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```

1. **NAME** = **NAME** (Name of the person who is the owner of the car)
 2. **MODEL** = **MODEL** (Model of the car)
 3. **PRICE** = **PRICE** (Price of the car)
 4. **YEAR** = **YEAR** (Year of the car)
 5. **TYPE** = **TYPE** (Type of the car)
 6. **STATUS** = **STATUS** (Status of the car)
 7. **LOCATION** = **LOCATION** (Location of the car)
 8. **OWNER** = **OWNER** (Owner of the car)
 9. **CONTACT** = **CONTACT** (Contact information of the owner)
 10. **DESCRIPTION** = **DESCRIPTION** (Description of the car)

PT(1)	EXP(7)	NAME(1)	DATE	TIME	STATUS	NOT
PT(1)	EXP(7)	NAME(1)	DATE	TIME	STATUS	NOT

.....7.*.....

4017 CONTINUE
4309 CONTINUE
5005 RETURN
5006 IF=1
5007 RETURN
END

LOCAL STATEMENTS = 64, PROGRAM SIZE = 6592 BYTES, PROGRAM NAME = CSMINV

NO DIAGNOSTICS GENERATED.

COMPILATION IS *****

LT NOLIST MAP NOXREF GOSTMT NOCHECK SOURCE TERM OBJECT FIA
OPT(0) LARGLEV(00) NOPIFS FLAG(1) NAME(MAIN) LINECOUNT(0)

*.....1.....2.....3.....4.....5.....6.....7.....

```

SUBROUTINE AOXIL
  DIMENSION YLV(31),FJ(100),FA(5)
  COMMON/DO40/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
  1VC3(50025),VH(27),VYH(243),VJ(27),VYJ(243)
  2,NH(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
  3,(24,2),AI(14,4),AF(144),AYMO(24),AEMO(24),S(24),NAME(40),ICG(3)
  COMMON/DO41/ CH1,VH,VYH,VYJ,FM,SM,TSAS,SAC,
  1,AI,AYMO,AEMO,S
  COMMON/DO42/ FACIC(140),FACIM(140)
  COMMON/INTCOM/ LMPH,LM,NLM,NLMM,N,NM,NDIM,NSPH,LMTPLS,LMT,LMTPLS,
  1NSAS,NX,NXS,NXM
  DATA P147/ 12.006370614356/
  IF(JOBC.NE.1) GO TO 18
  LX=LMPH-1
  NL=LXPC-LMPC
  NLN=NL-1
  N=NSPH*NL
  NX=N-NSPH
  NDI=N+NX
  LMTPLS=LMPH+LMPG-1
  LMT=LMTPLS-1
  LMTPLS=LMTPLS-LMTPLC
  NSAS=NSPH-1
  NX=LX-LMPH+LXPC
  NXNS=NX*NX
  NXNS=NXNS+NX
  FACIC(1)=1.000
  DO 17 I=2,NFAC
  A=1-1
  10 FACI(I)=A*FACI(I-1)
  DO 15 LF=1,LMTPLS
  L=LF-1
  LPL=L+L
  DO 16 I3=1,Lf
  I=I3-1
  L2=LF-I
  L3=LF+I
  N=LF*L/2+1
  A=LPL*FACI(L2)/FACI(LPM)
  A=N/PI4
  15 FACI(I3)=OSQRT(A)
  DO 17 LF=1,LXPC
  L1=LF-1
  L2=LF+L1
  L3=-LF
  DO 17 MF=1,NFV
  M1=M1+1
  DO 17 L3=1,LXPC
  L2=L3-1
  L3=L3+L2
  L2=-L3
  LKINP3=1+NS(L2-L1)+1
  LMAXPC=L3+L1
  DO 17 MS=1,NST
  M2=M2+1
  M2=M1+M2
  DO 17 LT=LKINP3,LMAXPC
  L3=LT-1
  IF(M3.LT.-L3.OR.M3.GT.L3) GO TO 17
  IV=INT((L1,L2,L3,M1,M2,M3))
  VCP(IV)=CLSC(L1,L2,L3,M1,M2,M3)
  17 CONTINUE
  15 IF(JOBC.GT.2) RETURN
  IVY=0
  IVNH=0
  DO 20 NF=1,NSPH
  NPL=NPL+1
  DO 20 NS=NFPL,NSPH
  RX=RAX(NS)-RAX(NF)
  RY=RY(NS)-RY(NF)
  RZ=RZ(NS)-RZ(NF)
  CALL POLAR(RX,RY,RZ,RN,OUTH,SRTH,CRPH,SRPH)
  CALL SPHAR(OUTH,SRTH,CRPH,SRPH,LMTPLS,YLV)
  DO 20 IV=1,LMTPLS
  IVT=IV+IVY

```

1 NOLIST MAP NOXREF GUSTYT NOOLCK SOURCE TLFM OBJECT FIXED
 1 CRT(0) LANGEVL(00) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(55)

.....1.....2.....3.....4.....5.....6.....7.4.

```

SUBROUTINE RSM
  1 (LYPC,NGRXX,VK,JCL)
  1 I=1,IC11,REAL#R(A-F,C-2)
  1 C=XX/0J00/ RXX(3),RYY(3),RZZ(3),RIS(3),CR1(3),
  1 VCS(500,20),VH(27),VYH(243),VJ(27),VYJ(243)
  1 F4(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
  1 B(26,2),AI(144),AF(144),AMC(24),AEMC(24),S(24),NAME(40),TGS(3)
  1 C=PCLEZ*10 CRT,VH,VYH,VYJ,XY,SM,TSAS,SAC,
  1 X,AI,AF,AMC,AEMC,S
  1 DIMENSION
  1 CFJ(100),FN(7),FJ(100)
  1 C=PCLEZ*10 CFJ,CR11,VKR,JCFJ,A,B,C,D
  1 LA=LYPC-1
  1 LYFI=LYPC+1
  1 C=2,1=1,NGRXX
  1 TGS1=TGS(1)+1
  1 IF(1-TGS1,1) GO TO 6
  1 TGS1=TGS1-1
  1 C=5,L=1,LA
  1 FN(L,1)=FN(L,TGS1)
  1 S*(L,1)=S*(L,TGS1)
  1 GO TO 20
  1 VKR=VKR*CR1(1)
  1 CR11=CR1(1)
  1 VKR=VKR*CR11
  1 CR11=CR11*CR11
  1 IF(DI143(VKR).EQ.C.CDC) GO TO 7
  1 CALL CRF(VKR,LYPC,JCL,CFJ)
  1 C=1,1
  1 VKR=DEAL(VKR)
  1 CALL CRF(VKR,LYPC,JCL,FJ)
  1 C=5,J=1,LYFI
  1 FJ(J)=FJ(J)
  1 CALL CRF(VKR,LYPC,JCL,FJ)
  1 CALL CRF(VKR,LYPC,IN)
  1 C=2,LD=2,LYPC
  1 L=LD-1
  1 F=LD
  1 F=LD+1
  1 LD=LD+1
  1 F=(LA*FN(L)-LD*FN(LDPC))
  1 FJ=(L*FJ(L)-LD*FJ(LDPC))
  1 C=JF=(L*CFJ(L)-LD*CFJ(LDPC))
  1 A=CFJ(LD)+VH*CFK+FN(LD)*E
  1 S=VKR*CFJ+CFJ(LD)*E
  1 C=CFJ(LD)+(VKR*CFJ+FJ(LD)*E)
  1 C=FJ(LD)+C
  1 F=FN(LD)*C
  1 F(L,1)=1.000/(1.000+(C.CDC,1.000)*((A-B)/(C-D)))
  1 F(L,1)=1.000/(1.000+(C.CDC,1.000)*((CR11*A-B)/(CR11*C-D)))
  1 C=11,10
  1 RETURN
  1 END
  
```

TIME 11 52

.....1.....2.....3.....4.....5.....6.....7.*.....

[illegible]

FCCT NLIST MAP NOXREL GUSTMT NOCHECK SOURCE TERM OBJECT FIXEL NO
 OPT(3) LANGLEV(26) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(25)

.....1.....2.....3.....4.....5.....6.....7....

```

SUBROUTINE SZOT
1  (IHELP, IEXP, VK, THK, PHK, VOUTA)
IMPLICIT REAL*8(A-H, O-Z)
COMMON /D040/ PXX(3), KYY(3), RZZ(3), RCS(3), CKI(3),
1VC3(50025), VH(27), VYH(243), VJ(27), VYJ(243)
2, KAI(4,3), SM(4,3), TSAS(2,2), SAC(2,2),
3A(24,2), AI(144), AH(144), AVMS(24), AEMC(24), S(24), NAME(40), ICG(3)
COMPLEX*16 CHI, VHI, VYH, VYJ, KM, SM, TSAS, SAC,
1A, AI, AF, AMX, AEMC, S
COMMON /D045/ AV(144,144), BV(144), V(144)
COMPLEX*16 AM, BV
COMMON /INTCC/ LMPD, LM, NLM, ALMM, K, NM, KDIM, NSPH, LMTPL, LMT, LMTPE,
1, SSM, NXX, NXS, NMAN
COMPLEX*16 CCC, GIM, GLM, SCM, SSMSP, SSES, PHAS
C=1.0D0
CCD=(C.0D0,C.0D0)
IF (IHELP.EQ.1) GO TO 20
ISA=2
JSA=1
30 TC 30
ISA=1
JSA=2
40 IF (IEXP.NE.C) GO TO 60
I1=0
DO 50 I1=1, NSPH
DO 50 L1=1, LM
SSMSP=RV(L1, N1)
SSES=SV(L1, N1)
L1TPC=L1+L1+1
I1=-L1-1
DO 50 I1=1, L1TPC
I1=I1+1
I1=I1+1
S0=CCD
I2=0
DO 45 I2=1, L2
L2TPC=L2+L2+1
I2=-L2-1
DO 45 I2=1, L2TPC
I2=I2+1
I2=I2+1
50 S0=S0+K*(I2, JSA)*(SCM(N1, L1, M1, L2, I2)*IHELP+GIM(N1, L1, M1, L2, I2))
IF (VOUTA.EQ.C) GO TO 47
S0=JREAL(S0)
SUI=DIMAG(S0)
IF (JABS(S0).LT.VOUTA) S0K=C
IF (JABS(SUI).LT.VOUTA) SUI=C
S0=CCOMPLEX(S0, SUI)
47 BV(I1)=-S0*SSMSP
50 BV(I1+K)=S0*SSES*IHELP
RETURN
60 CKK=VK*OSIN(THK)*CCOS(PHK)
CKY=VK*OSIN(THK)*COS(PHK)
CKZ=VK*CCOS(THK)
DO 70 I=1, NSPH
IJ=(I-1)*LM
PKOR=CKK*KAX(I)+CKY*KYY(I)+CKZ*RZZ(I)
PHAS=CCEXP((C.0, 1.0)*PKOR)
K=1
KTPC=K+K+1
SSMSP=K4(K, I)
SSES=SV(K, I)
DO 70 J=1, NLM
I1=IJ+J
BV(I1)=-K(J, ISA)*PHAS*SSMSP
BV(I1+K)=K(J, ISA)*PHAS*SSES*IHELP
IF (J.LT.KTPC) GO TO 70
K=K+1
KTPC=KTPC+K+K+1
SSMSP=K4(K, I)
SSES=SV(K, I)
70 CONTINUE
RETURN
END

```

MAY 1983)

VS FORTRAN

DATE 1984 NOV 07

TIME 17

48

TECT NOLIST MAP NOXREF GOSINT ACDECK SOURCE TERM OBJECT FIXEL
 (PT(0)) LANGEVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....1.....2.....3.....4.....5.....6.....7....

```

SUBROUTINE SMAT
  IMPLICIT REAL*8(A-H,C-Z)
  COMMON/JOBS/ RXX(3),FYY(3),RZZ(3),RCS(3),CRI(3),
  1/CS(24,25),VH(27),VYH(243),VJ(27),VYJ(243)
  2,RA(4,3),SA(4,3),TSAS(2,2),SAC(2,2),
  3,CA(24,2),AI(144),AF(144),AYMO(24),AEMO(24),S(24),NAME(40),IGS(3)
  4,CMPLX*16,CI,VE,VYH,VYJ,RM,SM,TSAS,SAC,
  14,SI,AF,AYMO,AEMO,S
  5,MDI/DOHD/AY(144,144),BV(144),V(144)
  6,CMPLX*16,AY,BV
  7,CMPLX*16,IGS/LMPL,LM,NLM,NLNM,A,NM,NDIM,NSPH,LMTPL,LMT,LMTPLS,
  13,CS,KX,NXS,NXM
  8,CMPLX*16,GH,GK,SSMSP,SSESP,CGO,CGH,CGK
  9,CGO(0.000,0.000)
  10,I1=0
  11,DO I1=1,NSPH
  12,DO I1=1,LN
  13,SP=SA(I1,K1)
  14,SSP=SM(I1,N1)
  15,L1PL=L1+L1+1
  16,I1=-L1-1
  17,DO I1=1,L1PL
  18,I1=I1+1
  19,I1=I1+1
  20,I2=0
  21,DO I2=1,NSPH
  22,DO I2=1,N1) GO TO 20
  23,DO I2=1,NLM
  24,I2=I2+1
  25,AY(I1,I2)=CGO
  26,AY(I1,I2+N1)=CGO
  27,AY(I1+N1,I2)=CGO
  28,AY(I1+N1,I2+N1)=CGO
  29,I1=I1+1
  30,DO I1=1,N1) GO TO 20
  31,DO I1=1,NLM
  32,I1=I1+1
  33,L2PL=L2+L2+1
  34,I2=-L2-1
  35,DO I2=1,L2PL
  36,I2=I2+1
  37,I2=I2+1
  38,CGH=GH(I1,I1,I1,I2,N1)
  39,CGK=GK(I1,I1,I1,I2,N2)
  40,AY(I1,I2)=CGH*SSMSP
  41,AY(I1,I2+N1)=CGK*SSMSP
  42,AY(I1+N1,I2)=CGH*SSESP
  43,AY(I1+N1,I2+N1)=CGK*SSESP
  44,END
  27 CONTINUE
  28 CONTINUE
  29 CONTINUE
  30 RETURN
  31 END

```

(MAY 1983)

VS FORTRAN

DATE 1984 NOV 07

TIME 17 55 27

EFFECT NOLIST MAP NOREF GOSINT NODECK SOURCE TERM OBJECT FIXED NO
 OPT(0) LANGEVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECCC(1185)

........1.....2.....3.....4.....5.....6.....7.*...

```

SUBROUTINE CRESSE
1 VK=IHELP,
2 SCASEC,ABSSEC,TOTSEC,VCUTA)
13PLICIT REAL*8(A-F,C-Z)
COMMON/COMMON/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
1VC(200025),VH(27),VYH(243),VJ(27),VYJ(243)
2,R4(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
3A(24,2),AI(144),AF(144),AMNC(24),AEMC(24),S(24),NAME(40),ICS(3)
COMMON/COMMON/ CR1,VH,VYH,VYJ,FM,SM,TSAS,SAC,
1A,AI,AF,AMNC,AEMC,S
COMMON/COMMON/ LNPL,LM,ILM,ALMY,N,NM,NJIP,NSPH,LMTPL,LMT,LMTPLS,
1NSAC,IX,NXAS,IXM
COMMON/COMMON/ GIP,GLP,AM,AE,GI,GL,SUMY,SOME,CCC,CCCN,CFDET
C=0.000
CCC=(0.000,0.000)
CK=.5/(VK*VK)
CCN=-(0.000,1.000)*(1.5*CK/VK)
IF(IHELP.EQ.-1) GO TO 10
ISA=1
JSA=2
GO TO 12
10 ISA=2
JSA=1
12 II=0
DO 20 I=1,LM
LITPC=L1+L1+1
L1=-L1-1
DO 20 I=1,LITPC
L1=V1+1
II=II+1
L1=0
SUMY=CCC
SOME=CCC
DO 15 I=1,NSPH
L2=1,LM
L2=-L2-1
DO 15 I=1,L2+1
L2=12+1
L2=12+1
AI=AI(I2)
AE=AE(I2+LM)
GI=GIP(L1,I1,I2,L2,V2)
GL=GLP(L1,I1,I2,L2,V2)
SUMY=SUMY+AM*GI+AE*GL
15 CCN=SUMY+AM*GL+AE*GI
AI=AI(I1)=SUMY
AE=AE(I1)=SUMY
IF(VCUTA.EQ.CC) GO TO 27
DO 25 I=1,NLMY
AM=ORLAL(AMNC(I))
AI=ORLAL(AMNC(I))
AEK=ORLAL(AEMC(I))
AEI=ORLAL(AEMC(I))
IF(DABS(AM).LT.VCUTA)AM=CC
IF(DABS(AI).LT.VCUTA)AI=CC
IF(DABS(AEK).LT.VCUTA)AEK=CC
IF(DABS(AEI).LT.VCUTA)AEI=CC
AMNC(I)=COMPLX(AM,AI)
25 AEMC(I)=COMPLX(AEK,AEI)
27 SUMY=CCC
SOME=CCC
CFDET=CCC
DO 30 I=1,NLMY
AM=AMNC(I)
AE=AEMC(I)
GI=ORCONJG(AM)
GL=CCC*JG(AE)
SUMY=SUMY+GI*AM+GL*AE
CFDET=CFDET+ORCONJG(A(I,ISA))*(AM-IHELP*AE)
30 SUMY=SUMY+ORCONJG(A(I,ISA))*(AM+IHELP*AE)
SCASEC=CK*ORLAL(SUMY)
TOTSEC=-CK*ORLAL(SOME)
ABSSEC=TOTSEC-SCASEC
SAC(ISA,ISA)=SOME*CCCN
SAC(JSA,ISA)=CFDET*CCCN
RETURN
END

```


[illegible]

CARD 13 (2E20.8)

CI Mixing factor for the iterative inversion of the T-matrix. The value $CI=0.5$ ensures good convergence.

TOL Tolerance of the inverted T-matrix. In practice $T^*T^{-1} \leq TOL$.

 These quantities need be specified only when $INVER=0$.

CARD 14

VCUTM The elements of the T-matrix with magnitude smaller than this parameter are set to zero.

VCUTA The multipolar amplitudes of the scattered wave smaller than this value are set to zero.

VCUTN The multipolar amplitudes of the incident plane wave smaller than this value are set to zero.

The three quantities above are usually set to $1.0E-36$, a value that prevents the occurrence of program interrupts due to underflow.

MAXIT Number of the iterations if the T-matrix is to be
 inverted iteratively.
 NFAC Maximum value of the factorials to be used in the nor-
 malization factors.
 JCK }
 JCL } Dimension of the vector of the Bessel functions.
CARD 7 (3E20.8) (NSPH card)
 RXX(1) }
 RYY(1) } Cartesian coordinates of the centre of the l-th sphere
 RZZ(1) } in the cluster.
CARD 8 (4012)
 IOG(1) This index specifies the type of the l-th sphere in
 the cluster. If IOG(l+1)=IOG(l) the program does not
 recalculate the T-matrices for the l+1-th sphere but
 assume they are identical to those of the l-th sphere.
CARD 9 (3E20.8)
 ROS(1) Radius of the l-th sphere.
CARD 10 (2E20.8) (NSPH card)
 CRI(1) Complex refractive index of the l-th sphere.
CARD 11 (E20.8, 2F10.4)
 VK Magnitude of the wavevector of the incident wave
 THK }
 PHK } Polar angles (in Degrees) of the incident wavevector.
CARD 12 (315)
 INVER 0 the T-matrix is inverted iteratively.
 1 the T-matrix is inverted by LU factorization.
 MODE 0, 1, 2, 3. This parameter provides the equilibration
 of the T-matrix in four different modes. The value
 MODE=3 has proved to be the most suitable for dielec-
 tric clusters far from resonance.
 NDDMST Maximum dimension of the T-matrix. must be equal to
 the dimension of the matrix AM.

PRG2 and PRG3

These programs were written at the CRDC by F.Borghese, P.Denti and R.Saija in order to handle relatively big clusters (see Table 1), even at the cost of increasing the CPU time. PRG3 differs from PRG2 in that it does not require the storage of the Clebsch-Gordan coefficients.

INPUT DESCRIPTION

Refer to DATASET TEST001.

CARD 1 (3A4)

IDATA JDATA KDATA	}	These quantities identify the DATASET. They can be left blank if desired.
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CARD 2 blank

CARD 3 (12)

NCAL Number of the group of data within the DATASET.

CARD 4 (40A4) (2 cards)

NAME This heading identifies the output. Any alphameric character can be used.

CARD 5 (412)

JG0 IWMA IWSS IWCIP	}	These quantities control the input and output operations of PRG2 and PRG3. Their meaning is explained in the comment cards within the programs. Note that if JG0 is put equal to 1 for all groups of data the programs run properly but for that they recompute matrices whose elements have still valid values.
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CARD 6 (812)

NSPH Number of the spheres in the cluster.

LMPO L_M+1

IHELP Helicity of the incident plane wave. Use +1 for right helicity and -1 for left helicity.

IEXP This quantity was originally introduced to control the convergency of the multipolar expansions. Set it to 0.

.....1.....2.....3.....4.....5.....6.....7......

```

1      COMPLEX FUNCTION CDDI*16(Z,A,B,N,ISTEP)
2      COMPLEX*16 Z,A(1),B(1)
3      CDDI=Z
4      IF(N) 4,4,2
5      DO 3 J=1,N
6      CDDI=CDDI+A(1+(J-1)*ISTEP)*B(J)
7      RETURN
8      END
    
```

CS# SOURCE STATEMENTS = 8, PROGRAM SIZE = 934 BYTES, PROGRAM NAME = CDDI PAGE
 CS# NO DIAGNOSTICS GENERATED.
 END OF COMPILATION IS *****

*.....1.....2.....3.....4.....5.....6.....7.....

```

7+ 20 VYH(IVT)=DCCNUG(YLM(IV))
75   IVY=IVY+LMTPCS
76   ARG=FR*VK
77   CALL RBF(ARG,LMT,JCK,FJ)
78   CALL RNF(ARG,LMT,FN)
79   DO 20 IV=1,LMTPO
80     IVT=IV+IVH3
81 25 VY(IVT)=COMPLX(FJ(IV),FN(IV))
82   IVH3=IVH3+LMTPO
83 30 CONTINUE
84   IVY=0
85   IVH3=0
86   CC=0.000
87   DO 55 IF=1,NSPH
88     RX=-XXI(IF)
89     RY=-YYI(IF)
90     RZ=-ZZI(IF)
91     IF (RX.EQ.CC.AND.RY.EQ.CC.AND.RZ.EQ.CC) GO TO 50
92     CALL POLAR(RX,RY,RZ,RA,CRTH,SRTH,CRPH,SRPH)
93     CALL SPHAR(CRTH,SRTH,CRPH,SRPH,LMTPO,YLM)
94     DO 40 IV=1,LMTPCS
95       IVT=IV+IVY
96 40 VYJ(IVT)=JCCNUG(YLM(IV))
97   ARG=AR*VK
98   CALL RBF(ARG,LMT,JCK,FJ)
99   DO 45 IV=1,LMTPO
100    IVT=IV+IVH3
101 45 VJ(IVT)=FJ(IV)
102   IVY=IVY+LMTPCS
103   IVH3=IVH3+LMTPO
104   RETURN
105   END

```

8.....9.....1.....2.....3.....4.....5.....6.....7.....

[illegible]

EFFECT NOLIST MAP NAREF DISTMT NCODECK SOURCE TEFV OBJECT FIELD NAME
 (PTC) (L) (L) (L) (L) (L) (L) (L) (L) (L) (L)

1.....2.....3.....4.....5.....6.....7.....

```

1  COMPLEX FUNCTION, OR*10(REFL, L1, M1, L2, M2)
2  1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47/48/49/50/51/52/53/54/55/56/57/58/59/60/61/62/63/64/65/66/67/68/69/70/71/72/73/74/75/76/77/78/79/80/81/82/83/84/85/86/87/88/89/90/91/92/93/94/95/96/97/98/99/100/101/102/103/104/105/106/107/108/109/110/111/112/113/114/115/116/117/118/119/120/121/122/123/124/125/126/127/128/129/130/131/132/133/134/135/136/137/138/139/140/141/142/143/144/145/146/147/148/149/150/151/152/153/154/155/156/157/158/159/160/161/162/163/164/165/166/167/168/169/170/171/172/173/174/175/176/177/178/179/180/181/182/183/184/185/186/187/188/189/190/191/192/193/194/195/196/197/198/199/200/201/202/203/204/205/206/207/208/209/210/211/212/213/214/215/216/217/218/219/220/221/222/223/224/225/226/227/228/229/230/231/232/233/234/235/236/237/238/239/240/241/242/243/244/245/246/247/248/249/250/251/252/253/254/255/256/257/258/259/260/261/262/263/264/265/266/267/268/269/270/271/272/273/274/275/276/277/278/279/280/281/282/283/284/285/286/287/288/289/290/291/292/293/294/295/296/297/298/299/300/301/302/303/304/305/306/307/308/309/310/311/312/313/314/315/316/317/318/319/320/321/322/323/324/325/326/327/328/329/330/331/332/333/334/335/336/337/338/339/340/341/342/343/344/345/346/347/348/349/350/351/352/353/354/355/356/357/358/359/360/361/362/363/364/365/366/367/368/369/370/371/372/373/374/375/376/377/378/379/380/381/382/383/384/385/386/387/388/389/390/391/392/393/394/395/396/397/398/399/400/401/402/403/404/405/406/407/408/409/410/411/412/413/414/415/416/417/418/419/420/421/422/423/424/425/426/427/428/429/430/431/432/433/434/435/436/437/438/439/440/441/442/443/444/445/446/447/448/449/450/451/452/453/454/455/456/457/458/459/460/461/462/463/464/465/466/467/468/469/470/471/472/473/474/475/476/477/478/479/480/481/482/483/484/485/486/487/488/489/490/491/492/493/494/495/496/497/498/499/500/501/502/503/504/505/506/507/508/509/510/511/512/513/514/515/516/517/518/519/520/521/522/523/524/525/526/527/528/529/530/531/532/533/534/535/536/537/538/539/540/541/542/543/544/545/546/547/548/549/550/551/552/553/554/555/556/557/558/559/560/561/562/563/564/565/566/567/568/569/570/571/572/573/574/575/576/577/578/579/580/581/582/583/584/585/586/587/588/589/590/591/592/593/594/595/596/597/598/599/600/601/602/603/604/605/606/607/608/609/610/611/612/613/614/615/616/617/618/619/620/621/622/623/624/625/626/627/628/629/630/631/632/633/634/635/636/637/638/639/640/641/642/643/644/645/646/647/648/649/650/651/652/653/654/655/656/657/658/659/660/661/662/663/664/665/666/667/668/669/670/671/672/673/674/675/676/677/678/679/680/681/682/683/684/685/686/687/688/689/690/691/692/693/694/695/696/697/698/699/700/701/702/703/704/705/706/707/708/709/710/711/712/713/714/715/716/717/718/719/720/721/722/723/724/725/726/727/728/729/730/731/732/733/734/735/736/737/738/739/740/741/742/743/744/745/746/747/748/749/750/751/752/753/754/755/756/757/758/759/760/761/762/763/764/765/766/767/768/769/770/771/772/773/774/775/776/777/778/779/780/781/782/783/784/785/786/787/788/789/790/791/792/793/794/795/796/797/798/799/800/801/802/803/804/805/806/807/808/809/810/811/812/813/814/815/816/817/818/819/820/821/822/823/824/825/826/827/828/829/830/831/832/833/834/835/836/837/838/839/840/841/842/843/844/845/846/847/848/849/850/851/852/853/854/855/856/857/858/859/860/861/862/863/864/865/866/867/868/869/870/871/872/873/874/875/876/877/878/879/880/881/882/883/884/885/886/887/888/889/890/891/892/893/894/895/896/897/898/899/900/901/902/903/904/905/906/907/908/909/910/911/912/913/914/915/916/917/918/919/920/921/922/923/924/925/926/927/928/929/930/931/932/933/934/935/936/937/938/939/940/941/942/943/944/945/946/947/948/949/950/951/952/953/954/955/956/957/958/959/960/961/962/963/964/965/966/967/968/969/970/971/972/973/974/975/976/977/978/979/980/981/982/983/984/985/986/987/988/989/990/991/992/993/994/995/996/997/998/999/1000/1001/1002/1003/1004/1005/1006/1007/1008/1009/1010/1011/1012/1013/1014/1015/1016/1017/1018/1019/1020/1021/1022/1023/1024/1025/1026/1027/1028/1029/1030/1031/1032/1033/1034/1035/1036/1037/1038/1039/1040/1041/1042/1043/1044/1045/1046/1047/1048/1049/1050/1051/1052/1053/1054/1055/1056/1057/1058/1059/1060/1061/1062/1063/1064/1065/1066/1067/1068/1069/1070/1071/1072/1073/1074/1075/1076/1077/1078/1079/1080/1081/1082/1083/1084/1085/1086/1087/1088/1089/1090/1091/1092/1093/1094/1095/1096/1097/1098/1099/1100/1101/1102/1103/1104/1105/1106/1107/1108/1109/1110/1111/1112/1113/1114/1115/1116/1117/1118/1119/1120/1121/1122/1123/1124/1125/1126/1127/1128/1129/1130/1131/1132/1133/1134/1135/1136/1137/1138/1139/1140/1141/1142/1143/1144/1145/1146/1147/1148/1149/1150/1151/1152/1153/1154/1155/1156/1157/1158/1159/1160/1161/1162/1163/1164/1165/1166/1167/1168/1169/1170/1171/1172/1173/1174/1175/1176/1177/1178/1179/1180/1181/1182/1183/1184/1185/1186/1187/1188/1189/1190/1191/1192/1193/1194/1195/1196/1197/1198/1199/1200/1201/1202/1203/1204/1205/1206/1207/1208/1209/1210/1211/1212/1213/1214/1215/1216/1217/1218/1219/1220/1221/12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1 MAY 1983

VS FJ TRAN

DATE 1984 NOV 07

TIME 17 10

REPORT: ALIST, MAP, NCKREF, GOSTIN, NCKDECK, SOURCE, TERN, OBJECT, FIVE, ...
 (1) LAN, LVL(00), KOFIPS, FLAG(1), NAME(MAIN), LI, ECCOUNT(00)

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1  COMPLEX FUNCTION GP#16(X1,L1,Y1,L2,Y2)
2  IMPLICIT REAL*8 (A-H,C-Z)
3  COMMON / JUNK / IKA(2),RYI(3),RZ(3),FUS(3),C-1(3),
4  IVC(3),C2(3),VU(27),VYH(243),VU(27),VYU(243)
5  2,RYI(3),RYI(4,3),ISAS(2,2),SAC(2,2),
6  SA(24,2),SI(14,4),AF(14,4),FAC(24),ALAL(24),S(24),RAY(14),IGS(3)
7  COMPLEX*8 C1,VH,VYH,VYU,IY,SY,ISAS,SAC,
8  IY=IY+1,SY=SY+1,ISAS=ISAS+1,
9  C1=IY/1.0E-10,SY=SY/1.0E-10,LM,LMV,ALMV,N,NY,KOIV,KOPH,LMTPC,LMT,LMTPC,
10  IY=IY+1,SY=SY+1,ISAS=ISAS+1,
11  DATA P14/12.960370614555/
12  C1=(0.000,0.000)
13  SI=0.00
14  C1=0.00
15  IF (X1(1).E1.00.AND. IY(1).EQ.00.AND. RZ(1).E1.00) GO TO 20
16  IY=IY+1
17  C1=IY+1
18  IY=IY+1
19  IY=IY+1
20  IY=IY+1
21  IY=IY+1
22  IY=IY+1
23  IY=IY+1
24  IY=IY+1
25  IY=IY+1
26  IY=IY+1
27  IY=IY+1
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81  IY=IY+1
82  IY=IY+1
83  IY=IY+1
84  IY=IY+1
85  IY=IY+1
86  IY=IY+1
87  IY=IY+1
88  IY=IY+1
89  IY=IY+1
90  IY=IY+1
91  IY=IY+1
92  IY=IY+1
93  IY=IY+1
94  IY=IY+1
95  IY=IY+1
96  IY=IY+1
97  IY=IY+1
98  IY=IY+1
99  IY=IY+1
100 IY=IY+1

```

.....1.....2.....3.....4.....5.....6.....7.....

[illegible]

(MAY 1983)

VS FORTRAN

DATE 1984 NOV 07

TIME 17 0 14

OBJECT NAMELIST MAP NAMELEN GDSIM1 MDECK SOURCE TERM OBJECT FIXED
 PT(1) LANGEVL(00) REFIPS FLAS(1) NAME(MAIN) LINECOUNT(05)

4.....5.....6.....7.....

```

1  C=PLX*FUNCTION,CLP*1,(L1,M1,N2,L2,M2)
2  I=PLX*1,CLP*2(A-H,C-2)
3  C=PLX*1,CLP*3(A-H,C-2)
4  C=PLX*1,CLP*4(A-H,C-2)
5  C=PLX*1,CLP*5(A-H,C-2)
6  C=PLX*1,CLP*6(A-H,C-2)
7  C=PLX*1,CLP*7(A-H,C-2)
8  C=PLX*1,CLP*8(A-H,C-2)
9  C=PLX*1,CLP*9(A-H,C-2)
10 C=PLX*1,CLP*10(A-H,C-2)
11 C=PLX*1,CLP*11(A-H,C-2)
12 C=PLX*1,CLP*12(A-H,C-2)
13 C=PLX*1,CLP*13(A-H,C-2)
14 C=PLX*1,CLP*14(A-H,C-2)
15 C=PLX*1,CLP*15(A-H,C-2)
16 C=PLX*1,CLP*16(A-H,C-2)
17 C=PLX*1,CLP*17(A-H,C-2)
18 C=PLX*1,CLP*18(A-H,C-2)
19 C=PLX*1,CLP*19(A-H,C-2)
20 C=PLX*1,CLP*20(A-H,C-2)
21 C=PLX*1,CLP*21(A-H,C-2)
22 C=PLX*1,CLP*22(A-H,C-2)
23 C=PLX*1,CLP*23(A-H,C-2)
24 C=PLX*1,CLP*24(A-H,C-2)
25 C=PLX*1,CLP*25(A-H,C-2)
26 C=PLX*1,CLP*26(A-H,C-2)
27 C=PLX*1,CLP*27(A-H,C-2)
28 C=PLX*1,CLP*28(A-H,C-2)
29 C=PLX*1,CLP*29(A-H,C-2)
30 C=PLX*1,CLP*30(A-H,C-2)
31 C=PLX*1,CLP*31(A-H,C-2)
32 C=PLX*1,CLP*32(A-H,C-2)
33 C=PLX*1,CLP*33(A-H,C-2)
34 C=PLX*1,CLP*34(A-H,C-2)
35 C=PLX*1,CLP*35(A-H,C-2)
36 C=PLX*1,CLP*36(A-H,C-2)
37 C=PLX*1,CLP*37(A-H,C-2)
38 C=PLX*1,CLP*38(A-H,C-2)
39 C=PLX*1,CLP*39(A-H,C-2)
40 C=PLX*1,CLP*40(A-H,C-2)
41 C=PLX*1,CLP*41(A-H,C-2)
42 C=PLX*1,CLP*42(A-H,C-2)
43 C=PLX*1,CLP*43(A-H,C-2)
44 C=PLX*1,CLP*44(A-H,C-2)
45 C=PLX*1,CLP*45(A-H,C-2)
46 C=PLX*1,CLP*46(A-H,C-2)
47 C=PLX*1,CLP*47(A-H,C-2)
48 C=PLX*1,CLP*48(A-H,C-2)
49 C=PLX*1,CLP*49(A-H,C-2)
50 C=PLX*1,CLP*50(A-H,C-2)
51 C=PLX*1,CLP*51(A-H,C-2)
52 C=PLX*1,CLP*52(A-H,C-2)
53 C=PLX*1,CLP*53(A-H,C-2)
54 C=PLX*1,CLP*54(A-H,C-2)
55 C=PLX*1,CLP*55(A-H,C-2)
56 C=PLX*1,CLP*56(A-H,C-2)
57 C=PLX*1,CLP*57(A-H,C-2)
58 C=PLX*1,CLP*58(A-H,C-2)
59 C=PLX*1,CLP*59(A-H,C-2)
60 C=PLX*1,CLP*60(A-H,C-2)
61 C=PLX*1,CLP*61(A-H,C-2)
62 C=PLX*1,CLP*62(A-H,C-2)
63 C=PLX*1,CLP*63(A-H,C-2)
64 C=PLX*1,CLP*64(A-H,C-2)
65 C=PLX*1,CLP*65(A-H,C-2)
66 C=PLX*1,CLP*66(A-H,C-2)
67 C=PLX*1,CLP*67(A-H,C-2)
68 C=PLX*1,CLP*68(A-H,C-2)
69 C=PLX*1,CLP*69(A-H,C-2)
70 C=PLX*1,CLP*70(A-H,C-2)
71 C=PLX*1,CLP*71(A-H,C-2)
72 C=PLX*1,CLP*72(A-H,C-2)
73 C=PLX*1,CLP*73(A-H,C-2)
74 C=PLX*1,CLP*74(A-H,C-2)
75 C=PLX*1,CLP*75(A-H,C-2)
76 C=PLX*1,CLP*76(A-H,C-2)
77 C=PLX*1,CLP*77(A-H,C-2)
78 C=PLX*1,CLP*78(A-H,C-2)
79 C=PLX*1,CLP*79(A-H,C-2)
80 C=PLX*1,CLP*80(A-H,C-2)
81 C=PLX*1,CLP*81(A-H,C-2)
82 C=PLX*1,CLP*82(A-H,C-2)
83 C=PLX*1,CLP*83(A-H,C-2)
84 C=PLX*1,CLP*84(A-H,C-2)
85 C=PLX*1,CLP*85(A-H,C-2)
86 C=PLX*1,CLP*86(A-H,C-2)
87 C=PLX*1,CLP*87(A-H,C-2)
88 C=PLX*1,CLP*88(A-H,C-2)
89 C=PLX*1,CLP*89(A-H,C-2)
90 C=PLX*1,CLP*90(A-H,C-2)
91 C=PLX*1,CLP*91(A-H,C-2)
92 C=PLX*1,CLP*92(A-H,C-2)
93 C=PLX*1,CLP*93(A-H,C-2)
94 C=PLX*1,CLP*94(A-H,C-2)
95 C=PLX*1,CLP*95(A-H,C-2)
96 C=PLX*1,CLP*96(A-H,C-2)
97 C=PLX*1,CLP*97(A-H,C-2)
98 C=PLX*1,CLP*98(A-H,C-2)
99 C=PLX*1,CLP*99(A-H,C-2)
100 C=PLX*1,CLP*100(A-H,C-2)

```

(MAY 1963)

VS FORTRAN

DATE 1964 NOV 07

TIME 17 16

OBJECT LIST MAP DECKE SUBMIT NODECK SOURCE TERM OBJECT FIXED
OPT(7) LAJSIVE(20) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(35)

.....1.....2.....3.....4.....5.....6.....7....

10 CONTINUE NOC(N1,N2,N)

11 IF (P1..P1..P2) GO TO 20

12 N1=N1

13 N2=N2

14 N3=N3

15 IF (P1..P1..P2)

16 N1=N1

17 N2=N2

18 N3=N3

19 IF (P1..P1..P2)

20 N1=N1

21 N2=N2

22 IF (P1..P1..P2) GO TO 30

23 N1=N1

24 N2=N2

25 IF (P1..P1..P2) NOC(N1,N2,N)

26 IF (P1..P1..P2) NOC(N1,N2,N)

27 IF (P1..P1..P2)

28 IF (P1..P1..P2)

29 IF (P1..P1..P2)

30 IF (P1..P1..P2)

AY 1983)

VS FORTRAN

DATE 1984 NOV 07

TIME 17 56 17

ECR RELIST MAP NOREF GUSTMT NOJECK SOURCE TERM OBJECT FIXED NCT
OPT(0) LANGLEV(6) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(55)

*.....1.....2.....3.....4.....5.....6.....7.4....

```
FUNCTION IND(L1,L2,L3,M1,M2,M3)  
COMMON/INDC/CM,LM,NLM,LL,M,N,NDIM,NSPH,LMTPC,LMT,LMTPLS,  
1,NM,NMA,NVAC,NXM  
N1=L1+(L1+1)+M1+1  
N2=L1+(L2+1)+M2+1  
N3=L1+(L3+1)+M3+1  
IND=L1+L2+L3+N1+N2+N3-NXM  
RETURN  
END
```


AY 1983)

VS FLKTRAN

DATE 1984 NOV 07

TIME 17

18

1.....2.....3.....4.....5.....6.....7.....

S404 =FAC10 (J04)

S404 =FAC10 (J05)*FAC10 (J06)*FAC10 (J07)

1*FAC10 (J08)*FAC10 (J09)*FAC10 (J10)

S404 +=S404 1*S404 5/S404 2

CL04=SC 405,AT(C,CA 4)

10

11

12

7 1983)

VS FORTAN

DATE 1984 NOV 07

TIME 17

20

BT ANALYST MAP PEOPLE SUSINT NOLOCK SOURCE TERM OBJECT FILE NO
 OPT(0) LANGUAGE(00) ACPIPS FLAG(1) NAME(MAIN) LINECOUNT(15)

.....1.....2.....3.....4.....5.....6.....7.....

```

      SUM=0
      IF (X,N,JOK,FJ)
      1  P=1.0E-06*(A-F,C-2)
      2  DIMENSION FU(100)
      3  I=JOK
      4  IF (X-1.0E-06) 7,11,11
      5  FU(I)=P
      6  I=I+1
      7  IF (I-100) 7,11,11
      8  IF (I-100) 7,11,11
      9  IF (I-100) 7,11,11
      10 IF (I-100) 7,11,11
      11 IF (I-100) 7,11,11
      12 IF (I-100) 7,11,11
      13 IF (I-100) 7,11,11
      14 IF (I-100) 7,11,11
      15 IF (I-100) 7,11,11
      16 IF (I-100) 7,11,11
      17 IF (I-100) 7,11,11
      18 IF (I-100) 7,11,11
      19 IF (I-100) 7,11,11
      20 IF (I-100) 7,11,11
      21 IF (I-100) 7,11,11
      22 IF (I-100) 7,11,11
      23 IF (I-100) 7,11,11
      24 IF (I-100) 7,11,11
      25 IF (I-100) 7,11,11
      26 IF (I-100) 7,11,11
      27 IF (I-100) 7,11,11
      28 IF (I-100) 7,11,11
      29 IF (I-100) 7,11,11
      30 IF (I-100) 7,11,11
      31 IF (I-100) 7,11,11
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      33 IF (I-100) 7,11,11
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      35 IF (I-100) 7,11,11
      36 IF (I-100) 7,11,11
      37 IF (I-100) 7,11,11
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      48 IF (I-100) 7,11,11
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      56 IF (I-100) 7,11,11
      57 IF (I-100) 7,11,11
      58 IF (I-100) 7,11,11
      59 IF (I-100) 7,11,11
      60 IF (I-100) 7,11,11
      61 IF (I-100) 7,11,11
      62 IF (I-100) 7,11,11
      63 IF (I-100) 7,11,11
      64 IF (I-100) 7,11,11
      65 IF (I-100) 7,11,11
      66 IF (I-100) 7,11,11
      67 IF (I-100) 7,11,11
      68 IF (I-100) 7,11,11
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      71 IF (I-100) 7,11,11
      72 IF (I-100) 7,11,11
      73 IF (I-100) 7,11,11
      74 IF (I-100) 7,11,11
      75 IF (I-100) 7,11,11
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      77 IF (I-100) 7,11,11
      78 IF (I-100) 7,11,11
      79 IF (I-100) 7,11,11
      80 IF (I-100) 7,11,11
      81 IF (I-100) 7,11,11
      82 IF (I-100) 7,11,11
      83 IF (I-100) 7,11,11
      84 IF (I-100) 7,11,11
      85 IF (I-100) 7,11,11
      86 IF (I-100) 7,11,11
      87 IF (I-100) 7,11,11
      88 IF (I-100) 7,11,11
      89 IF (I-100) 7,11,11
      90 IF (I-100) 7,11,11
      91 IF (I-100) 7,11,11
      92 IF (I-100) 7,11,11
      93 IF (I-100) 7,11,11
      94 IF (I-100) 7,11,11
      95 IF (I-100) 7,11,11
      96 IF (I-100) 7,11,11
      97 IF (I-100) 7,11,11
      98 IF (I-100) 7,11,11
      99 IF (I-100) 7,11,11
      100 IF (I-100) 7,11,11
  
```

TIME 17 23

.....1.....2.....3.....4.....5.....6.....7.....8.....

[illegible]

TIME 17 00 21

..... 1 2 3 4 5 6 7 8

1) VS FORTRAN DATE 1984 NOV 03 TIME 10 00 48

CLIST MAP NOXREF GCSTMT NODECK SOURCE TERM OBJECT FIXED NOTE
 OPT(0) LANGLV(66) NCFIPS FLAG(1) NAME(MAIN) LINECCNT(85)

.....1.....2.....3.....4.....5.....6.....7.*.....

```

SUBROUTINE WLM
  I(KHELP,TH,PH,LVPC)
  IMPLICIT REAL*8(A-H,C-Z)
  DIMENSION YLM(26)
  COMMON/DC10/ RXX(3),YY(3),ZZ(3),RCS(3),CRI(3),
  LVH(27),VYH(243),VJ(27),VYJ(243)
  DATA(14,3),S(14,3),TSAS(2,2),SAC(2,2),
  S(24,2),AI(144),AF(144),AMMO(24),S(24),NAME(40),IUG(3)
  COMPLEX*16 CRI,VH,VYH,VYJ,RV,SM,TSAS,SAC,
  A,AI,AF,AVHO,AEVC,S
  COMMON/DC15/FACIT(40),FACRM(45)
  COMPLEX*16 YLM,AP,AM,AZ,CL
  DATA PI/ 3.14159265358979323846264338327
  LMP=LMP0+LMP0+1
  YLM(LMP)=(0.000,0.000)
  IHELP=1
  IF(KHELP.EQ.2) IHELP=-1
  P=-IHELP
  COST=CCOS(TH)
  SINT=CSIN(TH)
  COSP=CCOS(PH)
  SINT=CSIN(PH)
  CALL SPHAR(COST,SINT,COSP,SINT,LMP0,YLM)
  ALPH1=-COST*CCSP
  BETA1=-COST*SINT
  GAM1=SINT
  ALPH2=-SINT
  BETA2=-CCSP
  GAM2=COSP
  AP=.5*(DC4PLX(ALPH1,P*ALPH2)+DC4PLX(BETA1,P*BETA2)*(0.000,1.000))
  A1=.5*(DC4PLX(ALPH1,P*ALPH2)-DC4PLX(BETA1,P*BETA2)*(0.000,1.000))
  AZ=DC4PLX(GAM1,P*GAM2)
  DC4PLX(LF=2,LMP0)
  L=1
  LFTL=LF*L
  K=LFTL
  L=PI*(0.000,1.000)*L/OSQRT(X)
  L=L+LF
  L=1
  DO 100 IF=1,M
    L=1
    K=LFTL+M
    K=LFTL-4*(M+1)
    L=OSQRT(X)
    K=LFTL-4*(M+1)
    L=OSQRT(X)
    L=1
    YLM(K)=DC4JG(A1*LP*YLM(K+2)+AP*CM*YLM(K)+AZ*GZ*YLM(K+1))*CL
  100 CONTINUE
  END

```



```

083)          VS FORTRAN          DATE  1984 NOV 08          TIME  10 00 42
NGLIST  MAP NOXREF  GUSTMT NODECK  SOURCE  TERM  OBJECT FIXED  NOTE
OPT(0)  LANGVLVL(66) NOFIPS  FLAG(1)  NAME(MAIN )  LINECOUNT(85)
..*....1.....2.....3.....4.....5.....6.....7.*....

```

```

SUBROUTINE SMAT
  IMPLICIT REAL*8(A-H,C-Z)
  COMMON/SSMS/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
  1VH(27),VYH(243),VJ(27),VYJ(243)
  2,PA(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
  3AL(24,2),AL(144),AF(144),AMVO(24),AEMO(24),S(24),NAME(40),IDG(3)
  4COMPLEX*16 CH1,VH,VYH,VYJ,AM,SM,TSAS,SAC,
  1A,AL,AF,AMVO,AEMO,S
  2CZCZ/CC15/A*(144,144),bV(144),V(144)
  3COMPLEX*16 AV,BV
  4COMMON/INTCOM/LMPC,LV,NLV,NLMM,N,NM,NDIM,NSPH,LMTPC,LMT,LMTPCS,
  1SSVS,NX,NXS,NXAM
  2COMPLEX*16 GH,GK,SSVSP,SSESP,CCO,CGH,CGK
  3CCO=(0.000,0.000)
  4I1=0
  5DO 30 N1=1,NSPH
  6DO 30 L1=1,LV
  7SSISP=X1(L1,N1)
  8SSESP=S4(L1,N1)
  9L1TPC=L1+L1+1
  10M1=-L1-1
  11DO 30 M1=1,L1TPC
  12V1=V1+1
  13I1=I1+1
  14I2=0
  15DO 20 N2=1,NSPH
  16AF(12,NB,N1) DO TO 20
  17DO 10 J=1,NLV
  18I2=I2+1
  19AV(I1,I2)=CCO
  20AV(I1,I2+1)=CCO
  21AV(I1+N2,I2)=CCO
  22AV(I1+N2,I2+N2)=CCO
  23DO TO 20
  24N1=CCO(N1,N2,NSPH)
  25DO 27 L2=1,LV
  26L2TPC=L2+L2+1
  27M2=-L2-1
  28DO 27 M2=1,L2TPC
  29I2=I2+1
  30I2=I2+1
  31C1=0.0,AL,L1,M1,L2,M2)
  32C2=0.0,AL,L1,M1,L2,M2)
  33AV(I1,I2)=C1H*SSVSP
  34AV(I1,I2+1)=C2H*SSVSP
  35AV(I1+N2,I2)=C1H*SSESP
  36AV(I1+N2,I2+N2)=C2H*SSESP
  37DO TO 27
  38CONTINUE
  39CONTINUE
  40RETURN
  41END

```

1953)

VS FORTRAN

DATE 1984 NOV 08

TIME 10 00 39

NOLIST MAP NCXREF GOSTMT NCDECK SOURCE TERM OBJECT FIXED NOTE
 CPT(0) LANGLVL(66) NCIFPS FLAG(1) NAME(MAIN) LINECOUNT(85)

....*....1.....2.....3.....4.....5.....6.....7.*.....

```

SUBROUTINE CROSSE
1(VK, IHLP,
2SCASEC, ABSSEC, TOTSEC, VCUTA)
  IMPLICIT REAL*8(A-H, O-Z)
  COMMON/JO40/ RXX(3), RYY(3), RZZ(3), RCS(3), CRI(3),
  1VH(27), VYH(243), VJ(27), VYJ(2+3)
  2, R4(4,3), S4(4,3), TSAS(2,2), SAC(2,2),
  3, L(24,2), AI(144), AF(144), AMX(24), AEM(24), S(24), NAME(40), ICG(3)
  COMPLEX*16 CRI, VH, VYH, VYJ, RM, SM, TSAS, SAC,
  1W, AI, AF, AMX, AEM, S
  COMMON/INTCCV/LMPL, LM, NLY, NLMV, N, NM, NDIN, NSPH, LMTPC, LMT, LMTPCS,
  1NS*0, NMX, NMXS, NMXV
  COMPLEX*16 GIP, GLP, AM, AE, GI, GL, SUM4, SUME, CCO, CCCN, OFDET
  CC=0.000
  CC=(0.000, 0.000)
  CK=.5/(VK*VK)
  CCON=-(0.000, 1.000)*(.5*CK/VK)
  IF(IHLP.EQ.-1) GO TO 10
  ISA=1
  JSA=2
  GO TO 12
10 ISA=2
  JSA=1
12 I1=0
  DO 20 L1=1, LM
    L1TPC=L1+L1+1
    I1=-L1-1
    DO 20 I1=1, L1TPC
      I1=I1+1
      I2=0
      DO 15 A=CCO
        DO 15 A=CCO
        DO 15 L2=1, NSPH
          DO 15 L2=1, LM
            L2TPC=L2+L2+1
            I2=-L2-1
            DO 15 I2=1, L2TPC
              I2=I2+1
              I2=I2+1
              A1=AF(I2)
              A2=AF(I2+NLY)
              G1=GIP(L1, I1, A2, L2, V2)
              G2=GLP(L1, I1, A2, L2, V2)
              SUMV=SUMV+AM*G1+AE*G2
              SUME=SUME+AM*G2+AE*G1
              A1*(I1)=SUMV
              A2*(I1)=SUME
            IF(VCUTA.EQ.CC) GO TO 27
            DO 25 I=1, NLMV
              A1=UREAL(AMX(I))
              A2=DIAG(AMX(I))
              A1P=UREAL(AEM(I))
              A2P=DIAG(AEM(I))
              IF(DABS(A1).LT.VCUTA) A1=CC
              IF(DABS(A2).LT.VCUTA) A2=CC
              IF(DABS(A1P).LT.VCUTA) A1P=CC
              IF(DABS(A2P).LT.VCUTA) A2P=CC
              A1*(I)=COMPLEX(A1P, A2P)
              A2*(I)=COMPLEX(A2P, A1P)
            SUMV=CCO
            SUME=CCO
            OFDET=CCO
            DO 30 I=1, NLMV
              A1=A1*(I)
              A2=A2*(I)
              G1=CCCNJG(AM)
              G2=CCCNJG(AE)
              SUMV=SUMV+G1*AM+G2*AE
              OFDET=OFDET+CCCNJG(A1*(I, JSA))*A2*(I-IHLP*AE)
              SUME=SUME+CCCNJG(A2*(I, JSA))*A1*(I-IHLP*AE)
            SCASEC=CK*OREAL(SUMV)
            TOTSEC=-CK*OREAL(SUME)
            ABSSEC=ABSSEC-SCASEC
            SAC(JSA, ISA)=SUME*CCCN
            SAC(JSA, ISA)=OFDET+CCCN
          
```

ST NO. - DTSJIL ICCF LIBRARY FILE MAINTENANC

5...10...15...20...25...30...35...40...45...50...55...60...65...70...75...80

```

1 IF (JIN.EQ.1) GO TO 335
2 SC=330 I=1,NLMM
3 S(I)=MEMO(I)
4 GO TO 335
5 SC=340 I=1,NLMM
6 II=1+IN
7 S(I)=AF(II+NM)
8 GO TO 285
9 IN=IN+NLMM
10 WRITE(IA,6300)
11 IF (JIN.EQ.1,SPH) GO TO 370
12 JIN=10PH
13 GO TO 160
14 SC=AT=SCASEC/SCS
15 IF (I.EQ.1,NS,1) GO TO 360
16 ABS=AT=1.000
17 GO TO 385
18 ABS=AT=ABSSEC/ACS
19 T=AT=TSSEC/TCS
20 TSC=SCASEC/SCS
21 ABS=ABSSEC/ACS
22 TSC=TSSEC/TCS
23 IF (CHLP.EQ.1) TSAS(ISA,ISA)=TSAC(JSA,JSA)
24 CHAL=CHAL(SAC(ISA,ISA))/CHAL(TSAS(ISA,ISA))
25 CHSC=CHAS(SAC(ISA,ISA))/CHAS(TSAS(ISA,ISA))
26 WRITE(IA,6310) SCASEC,ABSSEC,T,TSSEC
27 WRITE(IA,6320) SC=AT,ABS=AT,T=AT
28 WRITE(IA,6330) JSA,ISA,ABS,TS
29 WRITE(IA,6340) ISA,ISA,SAC(ISA,ISA),JSA,ISA,SAC(JSA,ISA)
30 WRITE(IA,6350) ISA,ISA,DEFIN,ISA,ISA,ABSCH
31 IF (CHLP.EQ.1) GO TO 360
32 IF (CHAL(SAC(JSA,JSA))-CHAL(SAC(ISA,ISA)))/CHAL(SAC(JSA,JSA)
33 1))
34 CHSC=(CHAS(SAC(JSA,JSA))-CHAS(SAC(ISA,ISA)))/CHAS(SAC(JSA,JSA)
35 1))
36 WRITE(IA,6360) JSA,ISA,ABSCH,ISA,ISA,ABSCH
37 GO TO 160
38 335
39 360
40 370
41 380
42 390
43 400
44 410
45 420
46 430
47 440
48 450
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117 1140
118 1150
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120 1170
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RT NO. - DTSUTIL ICCF LIBRARY FILE MAINTENANC
5...10...15...20...25...30...35...40...45...50...55...60...65...70...75...80

```

3  ITER=-1
4  DO 140 K=1,NDIM
5  AI(K)=SV(K)
6  IF(VOUTA.EQ.CO) GO TO 170
7  DO 140 I=1,NDIM
8  DO 140 J=1,NDIM
9  DET=DETERM(AL(AI(I,J)))
10  DET=DETERM(AI(I,J))
11  IF(DETERM(AI(I,J)).LT.VOUTM) AIR=CO
12  IF(DETERM(AI(I,J)).LT.VOUTM) AVI=CO
13  A(I,J)=COMPLX(AVR,AVI)
14  GO TO 170
15  DO 140 K=1,NDIM
16  AI(K)=AI(K)*CI+AF(K)*CF
17  IF(VOUTA.EQ.CO) GO TO 173
18  DO 172 I=1,NDIM
19  DET=DETERM(AI(I))
20  DET=DETERM(AI(I))
21  IF(DETERM(AI(I)).LT.VOUTM) AIR=CO
22  IF(DETERM(AI(I)).LT.VOUTM) AVI=CO
23  A(I)=COMPLX(AIR,AVI)
24  GO TO 172
25  DO 140 J=1,NDIM
26  DET=DET-34(I,J)*AI(J)
27  IF(VOUTA.EQ.CO) GO TO 190
28  DET=DETERM(DET)
29  DET=DETERM(DET)
30  IF(DETERM(DET).LT.VOUTA) DETI=CO
31  IF(DETERM(DET).LT.VOUTA) DETI=CO
32  DET=COMPLX(DETR,DETI)
33  A(I)=DET
34  ITER=ITER+1
35  IF(ITER.EQ.10) GO TO 150
36  CALL CUSSE(VK,INTEL,SCASEC,VASSEC,ITSEC,VOUTA)
37  SC=1.0
38  IF(ITER.EQ.1) GO TO 150
39  SC=SC/SEC-1.0
40  IF(ITER.EQ.1) WRITE(14,900)ITER,SCSEC,SEC,DELTA
41  IF(DETERM(DELTA).LT.TOL) GO TO 150
42  IF(ITER.EQ.1) WRITE(14,910)GO TO 150
43  IF(ITER.EQ.1) CALL SWAT
44  IF(ITER.EQ.1) GO TO 150
45  IF(ITER.EQ.1) GO TO 150
46  IF(ITER.EQ.1) GO TO 150
47  IF(ITER.EQ.1) GO TO 150
48  IF(ITER.EQ.1) GO TO 150
49  IF(ITER.EQ.1) GO TO 150
50  IF(ITER.EQ.1) GO TO 150
51  IF(ITER.EQ.1) GO TO 150
52  IF(ITER.EQ.1) GO TO 150
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66  IF(ITER.EQ.1) GO TO 150
67  IF(ITER.EQ.1) GO TO 150
68  IF(ITER.EQ.1) GO TO 150
69  IF(ITER.EQ.1) GO TO 150
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71  IF(ITER.EQ.1) GO TO 150
72  IF(ITER.EQ.1) GO TO 150
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83  IF(ITER.EQ.1) GO TO 150
84  IF(ITER.EQ.1) GO TO 150
85  IF(ITER.EQ.1) GO TO 150
86  IF(ITER.EQ.1) GO TO 150
87  IF(ITER.EQ.1) GO TO 150
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92  IF(ITER.EQ.1) GO TO 150
93  IF(ITER.EQ.1) GO TO 150
94  IF(ITER.EQ.1) GO TO 150
95  IF(ITER.EQ.1) GO TO 150
96  IF(ITER.EQ.1) GO TO 150
97  IF(ITER.EQ.1) GO TO 150
98  IF(ITER.EQ.1) GO TO 150
99  IF(ITER.EQ.1) GO TO 150
100 IF(ITER.EQ.1) GO TO 150

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 4 5 6
 7 8 9
 10 11 12
 13 14 15
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 22 23 24
 25 26 27
 28 29 30
 31 32 33
 34 35 36

0 (MAY 1983)

VS FORTRAN

DATE 1984 NOV 07

TIME 17

34

W EFFECT 10LIST 14P 10XREF 10SINT 10DECK 10SOURCE 10TEAM 10SUBJECT 10PAGE
101(0) 10LARGEVL(66) 10CFIPS 10FLAC(1) 10NAME(100) 10LINECOUNT(66)

#.....1.....2.....3.....4.....5.....6.....7.*..

```
1  COMPLEX FUNCTION FCT1(Z,A,B,N,ISTEP)
2  COMPLEX*16 Z,A(1),B(1)
3  COMPLEX*16 FCT1
4  IF (N) 4,1,2
5  2  J=1,N
6  3  FCT1=FCT1+A(1+(J-1)*ISTEP)*B(J)
7  4  RETURN
8  END
```

*.....1.....2.....3.....4.....5.....6.....7.....

```

75  AM(1,KOOL)=CTEMP
80  CONTINUE
81  4300  CONTINUE
82  5100  IF(I)=1
83  5200  RETURN
84  5300  IF(VCOI,1,0.0) RETURN
85  5400  CO=(0.0,0.0)
86  5500  I=0
87  5600  I=1,N
88  5700  J=1,N
89  5800  CO=CO+(1,J)
90  5900  AM=AM+L(CO)
91  6000  AM=AM+L(CO)
92  6100  IF(AM,1,0.0) GO TO 6200
93  6200  IF(AM,1,0.0) GO TO 6250
94  6300  CO=CO
95  6400  I=I+1
96  6500  IF(AM,1,0.0) GO TO 6250
97  6600  I=0
98  6700  I=I+1
99  6800  AM(1,0)=CO*CO*(AM,AM)
100 6900  CONTINUE
101 7000  RETURN
102 7100  END

```


EFFECT NLIST AP NLIST LOGIST NODLX SOURCE IFF OBJECT FIABO
 (C11(1) LA NLIST(1) NLISTS IFFS(1) NAME(MAIN) LINECOUNT(55)

*.....1.....2.....3.....4.....5.....6.....7.....

```

1      SUBROUTINE CSYINV(M,N,NDUMST,N,MODE,IER,VCST)
2      IMPLICIT REAL*8 (A-H,O-Z)
3      DIMENSION M(N,N),VCST(1),V(1)
4      COMMON /C11/ M,N,NDUMST,MODE,IER,VCST
5      DATA NLISTS,NLISTS(1),NLISTS(2),NLISTS(3),NLISTS(4),NLISTS(5),NLISTS(6),NLISTS(7),NLISTS(8),NLISTS(9),NLISTS(10),NLISTS(11),NLISTS(12),NLISTS(13),NLISTS(14),NLISTS(15),NLISTS(16),NLISTS(17),NLISTS(18),NLISTS(19),NLISTS(20),NLISTS(21),NLISTS(22),NLISTS(23),NLISTS(24),NLISTS(25),NLISTS(26),NLISTS(27),NLISTS(28),NLISTS(29),NLISTS(30),NLISTS(31),NLISTS(32),NLISTS(33),NLISTS(34),NLISTS(35),NLISTS(36),NLISTS(37),NLISTS(38),NLISTS(39),NLISTS(40),NLISTS(41),NLISTS(42),NLISTS(43),NLISTS(44),NLISTS(45),NLISTS(46),NLISTS(47),NLISTS(48),NLISTS(49),NLISTS(50),NLISTS(51),NLISTS(52),NLISTS(53),NLISTS(54),NLISTS(55)
6      IF (MODE.EQ.1) THEN
7          VCST(1) = 1.0
8          VCST(2) = 1.0
9          VCST(3) = 1.0
10         VCST(4) = 1.0
11         VCST(5) = 1.0
12         VCST(6) = 1.0
13         VCST(7) = 1.0
14         VCST(8) = 1.0
15         VCST(9) = 1.0
16         VCST(10) = 1.0
17         VCST(11) = 1.0
18         VCST(12) = 1.0
19         VCST(13) = 1.0
20         VCST(14) = 1.0
21         VCST(15) = 1.0
22         VCST(16) = 1.0
23         VCST(17) = 1.0
24         VCST(18) = 1.0
25         VCST(19) = 1.0
26         VCST(20) = 1.0
27         VCST(21) = 1.0
28         VCST(22) = 1.0
29         VCST(23) = 1.0
30         VCST(24) = 1.0
31         VCST(25) = 1.0
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33         VCST(27) = 1.0
34         VCST(28) = 1.0
35         VCST(29) = 1.0
36         VCST(30) = 1.0
37         VCST(31) = 1.0
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39         VCST(33) = 1.0
40         VCST(34) = 1.0
41         VCST(35) = 1.0
42         VCST(36) = 1.0
43         VCST(37) = 1.0
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47         VCST(41) = 1.0
48         VCST(42) = 1.0
49         VCST(43) = 1.0
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51         VCST(45) = 1.0
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54         VCST(48) = 1.0
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56         VCST(50) = 1.0
57         VCST(51) = 1.0
58         VCST(52) = 1.0
59         VCST(53) = 1.0
60         VCST(54) = 1.0
61         VCST(55) = 1.0
62     ELSE
63         VCST(1) = 1.0
64         VCST(2) = 1.0
65         VCST(3) = 1.0
66         VCST(4) = 1.0
67         VCST(5) = 1.0
68         VCST(6) = 1.0
69         VCST(7) = 1.0
70         VCST(8) = 1.0
71         VCST(9) = 1.0
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73         VCST(11) = 1.0
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83         VCST(21) = 1.0
84         VCST(22) = 1.0
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93         VCST(31) = 1.0
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96         VCST(34) = 1.0
97         VCST(35) = 1.0
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102        VCST(40) = 1.0
103        VCST(41) = 1.0
104        VCST(42) = 1.0
105        VCST(43) = 1.0
106        VCST(44) = 1.0
107        VCST(45) = 1.0
108        VCST(46) = 1.0
109        VCST(47) = 1.0
110        VCST(48) = 1.0
111        VCST(49) = 1.0
112        VCST(50) = 1.0
113        VCST(51) = 1.0
114        VCST(52) = 1.0
115        VCST(53) = 1.0
116        VCST(54) = 1.0
117        VCST(55) = 1.0
118     END IF
119     IF (MODE.EQ.2) THEN
120         VCST(1) = 1.0
121         VCST(2) = 1.0
122         VCST(3) = 1.0
123         VCST(4) = 1.0
124         VCST(5) = 1.0
125         VCST(6) = 1.0
126         VCST(7) = 1.0
127         VCST(8) = 1.0
128         VCST(9) = 1.0
129         VCST(10) = 1.0
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136         VCST(17) = 1.0
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149         VCST(30) = 1.0
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153         VCST(34) = 1.0
154         VCST(35) = 1.0
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158         VCST(39) = 1.0
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161         VCST(42) = 1.0
162         VCST(43) = 1.0
163         VCST(44) = 1.0
164         VCST(45) = 1.0
165         VCST(46) = 1.0
166         VCST(47) = 1.0
167         VCST(48) = 1.0
168         VCST(49) = 1.0
169         VCST(50) = 1.0
170         VCST(51) = 1.0
171         VCST(52) = 1.0
172         VCST(53) = 1.0
173         VCST(54) = 1.0
174         VCST(55) = 1.0
175     ELSE
176         VCST(1) = 1.0
177         VCST(2) = 1.0
178         VCST(3) = 1.0
179         VCST(4) = 1.0
180         VCST(5) = 1.0
181         VCST(6) = 1.0
182         VCST(7) = 1.0
183         VCST(8) = 1.0
184         VCST(9) = 1.0
185         VCST(10) = 1.0
186         VCST(11) = 1.0
187         VCST(12) = 1.0
188         VCST(13) = 1.0
189         VCST(14) = 1.0
190         VCST(15) = 1.0
191         VCST(16) = 1.0
192         VCST(17) = 1.0
193         VCST(18) = 1.0
194         VCST(19) = 1.0
195         VCST(20) = 1.0
196         VCST(21) = 1.0
197         VCST(22) = 1.0
198         VCST(23) = 1.0
199         VCST(24) = 1.0
200         VCST(25) = 1.0
201         VCST(26) = 1.0
202         VCST(27) = 1.0
203         VCST(28) = 1.0
204         VCST(29) = 1.0
205         VCST(30) = 1.0
206         VCST(31) = 1.0
207         VCST(32) = 1.0
208         VCST(33) = 1.0
209         VCST(34) = 1.0
210         VCST(35) = 1.0
211         VCST(36) = 1.0
212         VCST(37) = 1.0
213         VCST(38) = 1.0
214         VCST(39) = 1.0
215         VCST(40) = 1.0
216         VCST(41) = 1.0
217         VCST(42) = 1.0
218         VCST(43) = 1.0
219         VCST(44) = 1.0
220         VCST(45) = 1.0
221         VCST(46) = 1.0
222         VCST(47) = 1.0
223         VCST(48) = 1.0
224         VCST(49) = 1.0
225         VCST(50) = 1.0
226         VCST(51) = 1.0
227         VCST(52) = 1.0
228         VCST(53) = 1.0
229         VCST(54) = 1.0
230         VCST(55) = 1.0
231     END IF
232     IF (MODE.EQ.3) THEN
233         VCST(1) = 1.0
234         VCST(2) = 1.0
235         VCST(3) = 1.0
236         VCST(4) = 1.0
237         VCST(5) = 1.0
238         VCST(6) = 1.0
239         VCST(7) = 1.0
240         VCST(8) = 1.0
241         VCST(9) = 1.0
242         VCST(10) = 1.0
243         VCST(11) = 1.0
244         VCST(12) = 1.0
245         VCST(13) = 1.0
246         VCST(14) = 1.0
247         VCST(15) = 1.0
248         VCST(16) = 1.0
249         VCST(17) = 1.0
250         VCST(18) = 1.0
251         VCST(19) = 1.0
252         VCST(20) = 1.0
253         VCST(21) = 1.0
254         VCST(22) = 1.0
255         VCST(23) = 1.0
256         VCST(24) = 1.0
257         VCST(25) = 1.0
258         VCST(26) = 1.0
259         VCST(27) = 1.0
260         VCST(28) = 1.0
261         VCST(29) = 1.0
262         VCST(30) = 1.0
263         VCST(31) = 1.0
264         VCST(32) = 1.0
265         VCST(33) = 1.0
266         VCST(34) = 1.0
267         VCST(35) = 1.0
268         VCST(36) = 1.0
269         VCST(37) = 1.0
270         VCST(38) = 1.0
271         VCST(39) = 1.0
272         VCST(40) = 1.0
273         VCST(41) = 1.0
274         VCST(42) = 1.0
275         VCST(43) = 1.0
276         VCST(44) = 1.0
277         VCST(45) = 1.0
278         VCST(46) = 1.0
279         VCST(47) = 1.0
280         VCST(48) = 1.0
281         VCST(49) = 1.0
282         VCST(50) = 1.0
283         VCST(51) = 1.0
284         VCST(52) = 1.0
285         VCST(53) = 1.0
286         VCST(54) = 1.0
287         VCST(55) = 1.0
288     ELSE
289         VCST(1) = 1.0
290         VCST(2) = 1.0
291         VCST(3) = 1.0
292         VCST(4) = 1.0
293         VCST(5) = 1.0
294         VCST(6) = 1.0
295         VCST(7) = 1.0
296         VCST(8) = 1.0
297         VCST(9) = 1.0
298         VCST(10) = 1.0
299         VCST(11) = 1.0
300         VCST(12) = 1.0
301         VCST(13) = 1.0
302         VCST(14) = 1.0
303         VCST(15) = 1.0
304         VCST(16) = 1.0
305         VCST(17) = 1.0
306         VCST(18) = 1.0
307         VCST(19) = 1.0
308         VCST(20) = 1.0
309         VCST(21) = 1.0
310         VCST(22) = 1.0
311         VCST(23) = 1.0
312         VCST(24) = 1.0
313         VCST(25) = 1.0
314         VCST(26) = 1.0
315         VCST(27) = 1.0
316         VCST(28) = 1.0
317         VCST(29) = 1.0
318         VCST(30) = 1.0
319         VCST(31) = 1.0
320         VCST(32) = 1.0
321         VCST(33) = 1.0
322         VCST(34) = 1.0
323         VCST(35) = 1.0
324         VCST(36) = 1.0
325         VCST(37) = 1.0
326         VCST(38) = 1.0
327         VCST(39) = 1.0
328         VCST(40) = 1.0
329         VCST(41) = 1.0
330         VCST(42) = 1.0
331         VCST(43) = 1.0
332         VCST(44) = 1.0
333         VCST(45) = 1.0
334         VCST(46) = 1.0
335         VCST(47) = 1.0
336         VCST(48) = 1.0
337         VCST(49) = 1.0
338         VCST(50) = 1.0
339         VCST(51) = 1.0
340         VCST(52) = 1.0
341         VCST(53) = 1.0
342         VCST(54) = 1.0
343         VCST(55) = 1.0
344     END IF
345     IF (MODE.EQ.4) THEN
346         VCST(1) = 1.0
347         VCST(2) = 1.0
348         VCST(3) = 1.0
349         VCST(4) = 1.0
350         VCST(5) = 1.0
351         VCST(6) = 1.0
352         VCST(7) = 1.0
353         VCST(8) = 1.0
354         VCST(9) = 1.0
355         VCST(10) = 1.0
356         VCST(11) = 1.0
357         VCST(12) = 1.0
358         VCST(13) = 1.0
359         VCST(14) = 1.0
360         VCST(15) = 1.0
361         VCST(16) = 1.0
362         VCST(17) = 1.0
363         VCST(18) = 1.0
364         VCST(19) = 1.0
365         VCST(20) = 1.0
366         VCST(21) = 1.0
367         VCST(22) = 1.0
368         VCST(23) = 1.0
369         VCST(24) = 1.0
370         VCST(25) = 1.0
371         VCST(26) = 1.0
372         VCST(27) = 1.0
373         VCST(28) = 1.0
374         VCST(29) = 1.0
375         VCST(30) = 1.0
376         VCST(31) = 1.0
377         VCST(32) = 1.0
378         VCST(33) = 1.0
379         VCST(34) = 1.0
380         VCST(35) = 1.0
381         VCST(36) = 1.0
382         VCST(37) = 1.0
383         VCST(38) = 1.0
384         VCST(39) = 1.0
385         VCST(40) = 1.0
386         VCST(41) = 1.0
387         VCST(42) = 1.0
388         VCST(43) = 1.0
389         VCST(44) = 1.0
390         VCST(45) = 1.0
391         VCST(46) = 1.0
392         VCST(47) = 1.0
393         VCST(48) = 1.0
394         VCST(49) = 1.0
395         VCST(50) = 1.0
396         VCST(51) = 1.0
397         VCST(52) = 1.0
398         VCST(53) = 1.0
399         VCST(54) = 1.0
400         VCST(55) = 1.0
401     ELSE
402         VCST(1) = 1.0
403         VCST(2) = 1.0
404         VCST(3) = 1.0
405         VCST(4) = 1.0
406         VCST(5) = 1.0
407         VCST(6) = 1.0
408         VCST(7) = 1.0
409         VCST(8) = 1.0
410         VCST(9) = 1.0
411         VCST(10) = 1.0
412         VCST(11) = 1.0
413         VCST(12) = 1.0
414         VCST(13) = 1.0
415         VCST(14) = 1.0
416         VCST(15) = 1.0
417         VCST(16) = 1.0
418         VCST(17) = 1.0
419         VCST(18) = 1.0
420         VCST(19) = 1.0
421         VCST(20) = 1.0
422         VCST(21) = 1.0
423         VCST(22) = 1.0
424         VCST(23) = 1.0
425         VCST(24) = 1.0
426         VCST(25) = 1.0
427         VCST(26) = 1.0
428         VCST(27) = 1.0
429         VCST(28) = 1.0
430         VCST(29) = 1.0
431         VCST(30) = 1.0
432         VCST(31) = 1.0
433         VCST(32) = 1.0
434         VCST(33) = 1.0
435         VCST(34) = 1.0
436         VCST(35) = 1.0
437         VCST(36) = 1.0
438         VCST(37) = 1.0
439         VCST(38) = 1.0
440         VCST(39) = 1.0
441         VCST(40) = 1.0
442         VCST(41) = 1.0
443         VCST(42) = 1.0
444         VCST(43) = 1.0
445         VCST(44) = 1.0
446         VCST(45) = 1.0
447         VCST(46) = 1.0
448         VCST(47) = 1.0
449         VCST(48) = 1.0
450         VCST(49) = 1.0
451         VCST(50) = 1.0
452         VCST(51) = 1.0
453         VCST(52) = 1.0
454         VCST(53) = 1.0
455         VCST(54) = 1.0
456         VCST(55) = 1.0
457     END IF
458     IF (MODE.EQ.5) THEN
459         VCST(1) = 1.0
460         VCST(2) = 1.0
461         VCST(3) = 1.0
462         VCST(4) = 1.0
463         VCST(5) = 1.0
464         VCST(6) = 1.0
465         VCST(7) = 1.0
466         VCST(8) = 1.0
467         VCST(9) = 1.0
468         VCST(10) = 1.0
469         VCST(11) = 1.0
470         VCST(12) = 1.0
471         VCST(13) = 1.0
472         VCST(14) = 1.0
473         VCST(15) = 1.0
474         VCST(16) = 1.0
475         VCST(17) = 1.0
476         VCST(18) = 1.0
477         VCST(19) = 1.0
478         VCST(20) = 1.0
479         VCST(21) = 1.0
480         VCST(22) = 1.0
481         VCST(23) = 1.0
482         VCST(24) = 1.0
483         VCST(25) = 1.0
484         VCST(26) = 1.0
485         VCST(27) = 1.0
486         VCST(28) = 1.0
487         VCST(29) = 1.0
488         VCST(30) = 1.0
489         VCST(31) = 1.0
490         VCST(32) = 1.0
491         VCST(33) = 1.0
492         VCST(34) = 1.0
493         VCST(35) = 1.0
494         VCST(36) = 1.0
495         VCST(37) = 1.0
496         VCST(38) = 1.0
497         VCST(39) = 1.0
498         VCST(40) = 1.0
499         VCST(41) = 1.0
500         VCST(42) = 1.0
501         VCST(43) = 1.0
502         VCST(44) = 1.0
503         VCST(45) = 1.0
504         VCST(46) = 1.0
505         VCST(47) = 1.0
506         VCST(48) = 1.0
507         VCST(49) = 1.0
508         VCST(50) = 1.0
509         VCST(51) = 1.0
510         VCST(52) = 1.0
511         VCST(53) = 1.0
512         VCST(54) = 1.0
513         VCST(55) = 1.0
514     ELSE
515         VCST(1) = 1.0
516         VCST(2) = 1.0
517         VCST(3) = 1.0
518         VCST(4) = 1.0
519         VCST(5) = 1.0
520         VCST(6) = 1.0
521         VCST(7) = 1.0
522         VCST(8) = 1.0
523         VCST(9) = 1.0
524         VCST(10) = 1.0
525         VCST(11) = 1.0
526         VCST(12) = 1.0
527         VCST(13) = 1.0
528         VCST(14) = 1.0
529         VCST(15) = 1.0
530         VCST(16) = 1.0
531         VCST(17) = 1.0
532         VCST(18) = 1.0
533         VCST(19) = 1.0
534         VCST(20) = 1.0
535         VCST(21) = 1.0
536         VCST(22) = 1.0
537         VCST(23) = 1.0
538         VCST(24) = 1.0
539         VCST(25) = 1.0
540         VCST(26) = 1.0
541         VCST(27) = 1.0
542         VCST(28) = 1.0
543         VCST(29) = 1.0
544         VCST(30) = 1.0
545         VCST(31) = 1.0
546         VCST(32) = 1.0
547         VCST(33) = 1.0
548         VCST(34) = 1.0
549         VCST(35) = 1.0
550         VCST(36) = 1.0
551         VCST(37) = 1.0
552         VCST(38) = 1.0
553         VCST(39) = 1.0
554         VCST(40) = 1.0
555         VCST(41) = 1.0
556         VCST(42) = 1.0
557         VCST(43) = 1.0
558         VCST(44) = 1.0
559         VCST(45) = 1.0
560         VCST(46) = 1.0
561         VCST(47) = 1.0
562         VCST(48) = 1.0
563         VCST(49) = 1.0
564         VCST(50) = 1.0
565         VCST(51) = 1.0
566         VCST(52) = 1.0
567         VCST(53) = 1.0
568         VCST(54) = 1.0
569         VCST(55) = 1.0
570     END IF
571     IF (MODE.EQ.6) THEN
572         VCST(1) = 1.0
573         VCST(2) = 1.0
574         VCST(3) = 1.0
575         VCST(4) = 1.0
576         VCST(5) = 1.0
577         VCST(6) = 1.0
578         VCST(7) = 1.0
579         VCST(8) = 1.0
580         VCST(9) = 1.0
581         VCST(10) = 1.0
582         VCST(11) = 1.0
583         VCST(12) = 1.0
584         VCST(13) = 1.0
585         VCST(14) = 1.0
586         VCST(15) = 1.0
587         VCST(16) = 1.0
588         VCST(17) = 1.0
589         VCST(18) = 1.0
590         VCST(19) = 1.0
591         VCST(20) = 1.0
592         VCST(21) = 1.0
593         VCST(22) = 1.0
594         VCST(23) = 1.0
595         VCST(24) = 1.0
596         VCST(25) = 1.0
597         VCST(26) = 1.0
598         VCST(27) = 1.0
599         VCST(28) = 1.0
600         VCST(29) = 1.0
601         VCST(30) = 1.0
602         VCST(31) = 1.0
603         VCST(32) = 1.0
604         VCST(33) = 1.0
605         VCST(34) = 1.0
606         VCST(35) = 1.0
607         VCST(36) = 1.0
608         VCST(37) = 1.0
609         VCST(38) = 1.0
610         VCST(39) = 1.0
611         VCST(40) = 1.0
612         VCST(41) = 1.0
613         VCST(42) = 1.0
614         VCST(43) = 1.0
615         VCST(44) = 1.0
616         VCST(45) = 1.0
617         VCST(46) = 1.0
618         VCST(47) = 1.0
619         VCST(48) = 1.0
620         VCST(49) = 1.0
621         VCST(50) = 1.0
622         VCST(51) = 1.0
623         VCST(52) = 1.0
624         VCST(53) = 1.0
625         VCST(54) = 1.0
626         VCST(55) = 1.0
627     ELSE
628         VCST(1) = 1.0
629         VCST(2) = 1.0
630         VCST(3) = 1.0
631         VCST(4) = 1.0
632         VCST(5) = 1.0
633         VCST(6) = 1.0
634         VCST(7) = 1.0
635         VCST(8) = 1.0
636         VCST(9) = 1.0
637         VCST(10) = 1.0
638         VCST(11) = 1.0
639         VCST(12) = 1.0
640         VCST(13) = 1.0
641         VCST(14) = 1.0
642         VCST(15) = 1.0
643         VCST(16) = 1.0
644         VCST(17) = 1.0
645         VCST(18) = 1.0
646         VCST(19) = 1.0
647         VCST(20) = 1.0
648         VCST(21) = 1.0
649         VCST(22) = 1.0
650         VCST(23) = 1.0
651         VCST(24) = 1.0
652         VCST(25) = 1.0
653         VCST(26) = 1.0
654         VCST(27) = 1.0
655         VCST(28) = 1.0
656         VCST(29) = 1.0
657         VCST(30) = 1.0
658         VCST(31) = 1.0
659         VCST(32) = 1.0
660         VCST(33) = 1.0
661         VCST(34) = 1.0
662         VCST(35) = 1.0
663         VCST(36) = 1.0
664         VCST(37) = 1.0
665         VCST(38) = 1.0
666         VCST(39) = 1.0
667         VCST(40) = 1.0
668         VCST(41) = 1.0
669         VCST(42) = 1.0
670         VCST(43) = 1.0
671         VCST(44) = 1.0
672         VCST(45) = 1.0
673         VCST(46) = 1.0
674         VCST(47) = 1.0
675         VCST(48) = 1.0
676         VCST(49) = 1.0
677         VCST(50) = 1.0
678         VCST(51) = 1.0
679         VCST(52) = 1.0
680         VCST(53) = 1.0
681         VCST(54) = 1.0
682         VCST(55) = 1.0
683     END IF
684     IF (MODE.EQ.7) THEN
685         VCST(1) = 1.0
686         VCST(2) = 1.0
687         VCST(3) = 1.0
688         VCST(4) = 1.0
689         VCST(5) = 1.0
690         VCST(6) = 1.0
691         VCST(7) = 1.0
692         VCST(8) = 1.0
693         VCST(9) = 1.0
694         VCST(10) = 1.0
695         VCST(11) = 1.0
696         VCST(12) = 1.0
697         VCST(13) = 1.0
698         VCST(14) = 1.0
699         VCST(15) = 1.0
700         VCST(16) = 1.0
701         VCST(17) = 1.0
702         VCST(18) = 1.0
703         VCST(19) = 1.0
704         VCST(20) = 1.0
705         VCST(21) = 1.0
706         VCST(22) = 1.0
707         VCST(23) = 1.0
708         VCST(24) = 1.0
709         VCST(25) = 1.0
710         VCST(26) = 1.0
711         VCST(27) = 1.0
712         VCST(28) = 1.0
713         VCST(29) = 1.0
714         VCST(30) = 1.0
715         VCST(31) = 1.0
716         VCST(32) = 1.0
717         VCST(33) = 1.0
718         VCST(34) = 1.0
719         VCST(35) = 1.0
720         VCST(36) = 1.0
721         VCST(37) = 1.0
722         VCST(38) = 1.0
723         VCST(39) = 1.0
724         VCST(40) = 1.0
725         VCST(41) = 1.0
726         VCST(42) = 1.0
727         VCST(43) = 1.0
728         VCST(44) = 1.0
729         VCST(45) = 1.0
730         VCST(46) = 1.0
731         VCST(47) = 1.0
732         VCST(48) = 1.0
733         VCST(49) = 1.0
734         VCST(50) = 1.0
735         VCST(51) = 1.0
736         VCST(52) = 1.0
737         VCST(53) = 1.0
738         VCST(54) = 1.0
739         VCST(55) = 1.0
740     ELSE
741         VCST(1) = 1.0
742         VCST(2) = 1.0
743         VCST(3) = 1.0
744         VCST(4) = 1.0
745         VCST(5) = 1.0
746         VCST(6) = 1.0
747         VCST(7) = 1.0
748         VCST(8) = 1.0
749         VCST(9) = 1.0
750         VCST(10) = 1.0
751         VCST(11) = 1.0
752         VC
```

.....1.....2.....3.....4.....5.....6.....7.....

```

70 PLMNS(J)=(B*X*PLMNS(K)-C*PLMNS(V))/A
71 IF (L-LV) 30, 31, 31
30 L=L+1
31 T=29
32 L=3
33 J=(L*(L+1))/L+2
34 A=L-1
35 B=L*L-1
36 J=L
37 A=J-1
38 J=J+1
39 PLMNS(J)=(L*X*PLMNS(K)-B*PLMNS(V))/A
40 IF (L-LV) 30, 31, 31
41 L=L+1
42 T=2
43 L=2
44 J=1
45 LAVL=(L*(L+1))/L+1
46 J=L+L+M+1
47 A=J-1
48 B=L-1
49 T=2
50 A=(2.0D+0+L*A*I*X)/Y
51 B=(L+L)*(L-M+1)
52 PLMNS(J)=A*PLMNS(K)-B*PLMNS(K)
53 IF (L-LV) 37, 38, 38
54 L=L+1
55 T=30
56 IF (L-LV) 30, 40, 40
57 L=L+1
58 T=30
59 J=1
60 J=L
61 J=L
62 LAVL=L*(L+1)
63 LAVL=L+1
64 LAVL=L+1/L+1
65 PLMNS(J)=LAVL*(PLMNS(K)+PLMNS(M+VE))
66 J=L+L+J
67 JAVL=L*(J+J)
68 JAVL=L*(J+J)*PLMNS(J)
69 J=L+J
70 J=L*(J+J)=JAVL+J*PLA(COSAMP(MA),SINAMP(MA))
71 IF (J-1).NE.0 YLJRS(1A)=-YLJRS(1A)
72 J=L+J
73 YLJRS(1A)=JAVL*COMPLA(COSAMP(MA),-SINAMP(MA))
74 IF (J-1) 40, 47, 47
75 J=J+1
76 J=L
77 IF (L-LV) 30, 40, 40
78 L=L+1
79 T=41
80 J=L+1
81 J=L
82 J=L

```

OBJECT	COLIST	2ND NAME	3RD NAME	NOSECK	SOURCE	TERM	OBJECT FIXED
	PT(1)	LANGLEV(40)	NO IPS	FLAG(1)	NAME(MAIN)		LINCCOUNT(55)

03 (MAY 1983)

VS FORTAN

DATE 1984 NOV 07

TIME 17 25

EFFECT K LIST MAP NOXREF SUBSTN NODECK SOURCE TERM OBJECT FILE
LPTID) LANGEV(00) AFFIPS FLAG(1) NAME(24K) LINECOUNT(5)

.....*.....1.....2.....3.....4.....5.....6.....7.*.....

SUBROUTINE POLAR(X,Y,Z,P,CTH,STH,CPH,SPH)

IMPLICIT REAL*8(A-H,I-Z)

PI=3.141592653589793

IF(P.EQ.0) GO TO 10

CPH=1.000000

STH=1.000000

CTH=0.000000

IF(C.EQ.0) GO TO 10

CTH=1.000000

STH=0.000000

CTH=0.000000

10 C=SQRT(X**2+Y**2+Z**2)

CTH=PI/2-ASIN(Z/C)

CTH=PI/2-CTH

STH=Y/C

15 CTH=2*PI

STH=0.000000

CTH=0.000000

CTH=0.000000

CTH=0.000000

(MAY 1983)

VS FORTRAN

DATE 1984 NOV 08

TIME 10 00 51

EFFECT NOLIST MAP NOXREF GOSTMT NODECK SOURCE TERM OBJECT FIXED NOTE
 OPT(0) LONGLVL(66) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....1.....2.....3.....4.....5.....6.....7......

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1  SUBROUTINE RSM
2    (LMPC,NGRMX,VK,JCL)
3    IMPLICIT REAL*8(A-H,C-Z)
4    COMMON/DUMC/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
5    VVH(27),VYH(243),VJ(27),VYJ(243)
6    2,R1(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
7    3,(24,2),AI(144),AF(144),AVMC(24),AEAC(24),S(24),NAME(40),IOG(3)
8    COMPLEX*16 CRI,VH,VYH,VYJ,KV,SM,TSAS,SAC,
9    1A,AI,AF,AVMC,AEAC,S
10   DIMENSION
11   IOFU(100),FN(7),FU(100)
12   COMPLEX*16 CFU,CRII,VKN,DCFU,A,B,C,D
13   LM=LMPC-1
14   LMPT=LMPC+1
15   DO 20 I=1,NGRMX
16     IOGI=IOG(I)+1
17     IF(IOGI.GT.1) GO TO 6
18     IOGI=IOGI-1
19     DO 5 L=1,LM
20       RXX(L,I)=KV(L,IOGI)
21       SM(L,I)=SM(L,IOGI)
22     GO TO 20
23   VKR=VK*RCS(I)
24   CRII=CRI(I)
25   VAI=VKR*CRII
26   CRII=CRII*CRII
27   IF(DIMAG(VKN).EQ.0.000) GO TO 7
28   CALL CBF(VKN,LMPC,JCL,CFU,IIR)
29   IF(IIR.EQ.0) STOP
30   GO TO 9
31   7   VKN=UREAL(VKN)
32   CALL RBF(VKN,LMPC,JCL,FU,IIR)
33   IF(IIR.EQ.1) STOP
34   DO 3 J=1,2*PT
35     CFU(J)=FU(J)
36   CALL RBF(VKR,LMPC,JCL,FU,IIR)
37   IF(IIR.EQ.1) STOP
38   CALL RNF(VKR,LMPC,FN)
39   DO 20 LO=2,LMPC
40     L=LO-1
41     L=LO+L
42     LCP=LO+1
43     CFU=(L*FN(L)-LO*FN(LDPL))
44     CFU=(L*FU(L)-LO*FU(LDPC))
45     CCFU=(L*CFU(L)-LO*CFU(LDPC))
46     A=CFU(LD)* (VKR*DFN+FN(LD)*E)
47     B=VAI*DCFU+CFU(LD)*E
48     C=CFU(LD)* (VKR*DFU+FU(LD)*E)
49     D=FU(LD)*B
50     E=FN(LD)*C
51     A(L,I)=1.000/(1.000+(0.000,1.000)*((C-D)/(C-D)))
52     B(L,I)=1.000/(1.000+(0.000,1.000)*((C-D)/(C-D)))
53   CONTINUE
54   RETURN
55   END

```

(MAY 1983)

VS FORTRAN

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TIME 10 00 53

EFFECT NOLIST MAP NCXREF GCSMT NCDECK SOURCE TERM OBJECT FIXED NOTE
 OPT(0) LANGLVL(66) NCIPPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....1.....2.....3.....4.....5.....6.....7......

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SUBROUTINE AUXIL
  IMPLICIT REAL*8(A-H,C-Z)
  DIMENSION YLM(81),FJ(100),FN(9)
  COMPLEX*16 YLM
  COMMON/COMMON/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
  1 VY(27),VYH(243),VJ(27),VYJ(243)
  2 S(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
  3 A(24,2),AI(144),AF(144),AMMC(24),AEMC(24),S(24),NAME(40),ICG(3)
  COMPLEX*16 CRI,VH,VYH,VYJ,RV,SM,TSAS,SAC,
  1 A,AI,AF,AMMC,AEMC,S
  COMMON/COMMON/FACTC(40),FNCRM(45)
  COMMON/INTCOM/LMPC,LN,NLM,NLMN,N,NM,NDIM,NSPH,LMTPC,LMT,LMTPCS,
  1 NSYC,NMX,NMXS,NMXM
  DATA PI4/ 12.566370614356/
  IF(JGC.EQ.1) GO TO 18
  LM=LMPD-1
  NLM=LMPD+LMPC
  NLMN=NLM-1
  N=N-NSPH
  NM=N-NSPH
  NDIM=NM+NM
  LMTPC=LMPD+LMPC-1
  LMT=LMTPC-1
  LMTPCS=LMTPC+LMTPC
  NSYC=NSPH-1
  NMX=L4+LMPD+LMPC
  NMXS=NMX+NMX
  NMXM=NMXS+NMX
  FACTC(1)=1.000
  DO 10 I=2,NFAC
    A=I-1
  10 FACTC(I)=A*FACTC(I-1)
    DO 15 LF=1,LMTPC
      L=LF-1
      LTPC=LF+L
      DO 15 LM=1,LF
        M=LM-1
        LYM=LF-M
        LPM=LF+M
        X=LF+L/2+M
        A=LTPC*FACTC(LMX)/FACTC(LPM)
        L=1/PI4
  15 FJ(LM)=COS(PI*A)
  19 IF(JGC.EQ.2) RETURN
    IVY=0
    IV=0
    DO 30 NF=1,NSYC
      LTPC=NF+1
      DO 30 NS=NFPC,NSPH
        RX=RXX(NS)-RXX(NF)
        RY=RYY(NS)-RYY(NF)
        RZ=RZZ(NS)-RZZ(NF)
        CALL POLAR(RX,RY,RZ,RR,CRTH,SRTH,CRPH,SRPH)
        CALL SPHAR(CRTH,SRTH,CRPH,SRPH,LMTPC,YLM)
      20 IV=1,LMTPCS
      IVT=IV+IVY
  20 VY(IVT)=COMPLX(FJ(IV),FN(IV))
      IVY=IVY+LMTPCS
      A3=FM+VK
      CALL RSH(AR3,LMT,JCK,FJ,IR)
      IF(II.EQ.1) STOP
      CALL RSH(AR3,LMT,FN)
      25 IV=1,LMTPC
      IVT=IV+IVH
  25 VY(IVT)=COMPLX(FJ(IV),FN(IV))
      IVH=IVH+LMTPC
  30 CONTINUE
    IVY=0
    IV=0
    DO 30 NF=1,NSPH
      RX=-RXX(NF)
      RY=-RYY(NF)
      RZ=-RZZ(NF)
      IF(RA.EQ.CO.AND.RY.EQ.CO.AND.RZ.EQ.CO) GO TO 50
      CALL POLAR(RX,RY,RZ,RR,CRTH,SRTH,CRPH,SRPH)

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.....1.....2.....3.....4.....5.....6.....7......

CC 40 IV=1,LMTPCS
IVT=IV+IVY
40 VYJ(IVT)=JCCNJG(YLM(IV))
ARG=RR+VK
CALL R3F(ARG,LMT,JCK,FJ,IIR)
IF(IIR.EQ.1) STOP
CC 45 IV=1,LMTPC
IVT=IV+IVH3
45 VJ(IVT)=FJ(IV)
50 IVY=IVY+LMTPCS
55 IVH3=IVH3+LMTPC
RETURN
END

(MAY 1983)

VS FLTRAN

DATE 1984 NOV 08

TIME 10 00 57

EFFECT NOLIST MAP NCXREF GOSTMT NCDECK SOURCE TERM CBJECT FIXED NCTE
 UPT(0) LANGLVL(66) NDFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

..........1.....2.....3.....4.....5.....6.....7.*.....

```

COMPLEX FUNCTION GH*16(NBL,L1,M1,L2,M2)
IMPLICIT REAL*8(A-H,C-Z)
CC1401/DC10/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
1VH(27),VYH(243),VJ(27),VYJ(243)
2,R*(4,3),SM(4,3),ISAS(2,2),SAC(2,2),
3A(24,2),AI(144),AF(144),AMMO(24),ALMO(24),S(24),NAME(40),IDG(3)
COMPLEX*16 CRI,VH,VYH,VYJ,RM,SM,ISAS,SAC,
1A,AI,AF,AMMO,ALMO,S
CC1401/INTCOM/LMPC,LM,NLM,NLMY,N,NM,NDIM,NSPH,LMTPO,LMT,LMTPCS,
1VSHO,NMX,NXKS,NMAX
COMPLEX*16 CSUM,CCC,CFUN
DATA PI/12.566370614356/
CC)=(C.CDS,C.CDC)
GH=CCC
L1PO=L1+1
LAIPO=IABS(L2-L1)+1
LVAXPC=L2+L1PO
CX=PI*4*(L1+L1PO)*(L2+L2+1)
CCR=DSQRT(CX)
ISN=1
IF(L2.GT.L1.AND.MOD(LMINPC,2).EQ.0) ISN=-ISN
IF(MOD(M2,2).NE.0) ISN=-ISN
IF(NBL.LT.0) GO TO 22
NBL40=NBL-1
GO TO 23
NBL40=-NBL-1
NBY=NBL40#LMTPO
NBY=NBL40#LMTPCS
GO 50 J4=1,3
CSUM=CCC
MC=J4-2
MUPM1=40+M1
MUPM2=40+M2
IF(MUPM1.LT.-L1.OR.MUPM1.GT.L1.OR.MUPM2.LT.-L2.OR.MUPM2.GT.L2)
1GO TO 50
JSN=ISN
CGC1=CLSG(1,L1,L1,-40,MUPM1,M1)
CGC2=CLSG(1,L2,L2,-40,MUPM2,M2)
CX=CGC1#CGC2
5555 F=CMAT(3110,6E15,6)
GO 40 LT=LMINPC,LVAXPC,2
L3=LT-1
M1M2=41-42
IF(M1M2.LT.-L3.OR.M1M2.GT.L3) GO TO 40
NY=L3#L3+LT+M1M2
ALB=L3+LT
CGC3=CLSG(L2,L1,L3,0,0,0)
CGC4=CLSG(L2,L1,L3,MUPM2,-MUPM1,M2-M1)
CFUN=JSN#VH(NBH+LT)#VYH(NPY+NY)#CGC3#CGC4/DSQRT(ACRS)
IF(NBL.GT.0) GO TO 35
IF(MOD(L3,2).NE.0) CFUN=-CFUN
35 CSUM=CSUM+CFUN
40 JSN=-JSN
CSUM=CSUM#CR
IF(40.NE.0) CSUM=-CSUM
50 GH=3#CSUM
GH=GH#CCR
RETURN
END

```


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TIME 10 00 59

EFFECT NOLIST MAP NOXREF GCSTMT NODECK SOURCE TERM OBJECT FIXED NCT
 OPT(0) LONGLVL(66) NCFIPS FLAG(1) NAME(MAIN) LINECCUNT(85)

..........1.....2.....3.....4.....5.....6.....7.*.....

```

1  COMPLEX FUNCTION GK*16(NBL,L1,M1,L2,M2)
2  IMPLICIT REAL*8(A-H,L-Z)
3  COMMON/DC47/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
  1VH(27),VYH(243),VJ(27),VYJ(243)
  2,R4(4,3),S4(4,3),TSAS(2,2),SAC(2,2),
  3,(24,2),AI(144),AF(144),AYMO(24),AEMC(24),S(24),NAME(40),IOG(3)
4  COMPLEX*16 CRI,VH,VYH,VYJ,R4,S4,TSAS,SAC,
  1A,AI,AF,AYMO,AEMC,S
5  COMMON/INTCOM/L4PC,LM,NLM,NLMM,A,NM,ADIM,NSPH,LMTPO,LMT,LMTPCS,
  1NSPH,NMX,NMXS,NMXM
6  COMPLEX*16 CCR,CSCM,CCC,CCI,CFUN
7  DATA PI/7.12.566370614356/
8  CCR=(0.000,0.000)
9  CCI=(0.000,1.000)
10 GK=CCR
11 LIM=L1-1
12 L1PO=L1+1
13 LMINPO=IABS(L2-L1PO)+1
14 LMAXPO=L2+L1
15 GK=PI*(L1+L1PO)*(L1+L1PO)*(L2+L2+1)/L1PO
16 CCR=DSQRT(GK)*CCI
17 ISN=1
18 IF(L2.GT.L1PO.AND.MOD(LMINPO,2).EQ.0) ISN=-ISN
19 IF(MOD(L2,2).NE.0) ISN=-ISN
20 IF(NBL.L1.0) GO TO 22
21 NBLVC=NBL-1
22 GO TO 23
23 NBLVC=-NBL-1
24 N3H=N3LVC*LMTPO
25 NBY=N3LVC*LMTPCS
26 DO 50 JX=1,3
27 CSCM=CCR
28 AC=J4-2
29 MPM1=M1+M1
30 MPM2=M2+M2
31 IF(MPM1.LT.-L1PO.OR.MPM1.GT.L1PO.OR.MPM2.LT.-L2.OR.MPM2.GT.L2)
32 GO TO 50
33 JSN=ISN
34 CGC1=CLGO(1,L1PO,L1,-VU,MPM1,M1)
35 CGC2=CLGO(1,L2,L2,-VU,MPM2,M2)
36 CR=CGC1*CGC2
37 DO 40 LT=LMINPO,LMAXPO,2
38 L3=LT-1
39 M1M2=M1-42
40 IF(M142.LT.-L3.OR.M1M2.GT.L3) GO TO 40
41 NY=L3*L3+LT+M1M2
42 AGRS=L3+LT
43 CGC3=CLGO(L2,L1PO,L3,0,0,0)
44 CGC4=CLGO(L2,L1PO,L3,MPM2,-MPM1,M2-41)
45 CFU=JSN*VH(NPH+LT)*VYH(NBY+NY)*CGC3*CGC4/DSQRT(AGRS)
46 N2H=N2H+LT
47 N3Y=N3Y+NY
48 IF(N3L.GT.0) GO TO 35
49 IF(MOD(L3,2).NE.0) CFUN=-CFUN
50 CSCM=CSCM+CFU
51 JSN=-JSN
52 CR=CGC4*CR
53 IF(MU.NE.0) CSCM=-CSCM
54 GK=GK+CSCM
55 GK=GK+CCR
56 RETURN
57 EN

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DATE 1984 NOV 08

TIME 10 01 02

ECT NCLIST MAP NCXREF GOSINT NCDECK SOURCE TERM OBJECT FIXED NOTES
 CPT(0) LANGVLVL(66) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(85) C

..........1.....2.....3.....4.....5.....6.....7.*.....

```

COMPLEX FUNCTION GIM*16(N1,L1,M1,L2,M2)
IMPLICIT REAL*8(A-H,C-Z)
COMMON/COMMON/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
1VH(27),VYH(243),VJ(27),VYJ(243)
2,S(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
3,(24,2),AI(144),AF(144),AYMO(24),AEMC(24),S(24),NAME(40),IDG(3)
COMPLEX*16 CRI,VH,VYH,VYJ,RM,SM,TSAS,SAC,
1,AI,AF,AYMO,AEMC,S
COMMON/INTCOM/LMPC,LM,ALM,ALMM,N,AM,NDIM,NSPH,LMTPC,LMT,LMTPCS,
1NSID,NXX,NMKS,NMAX
COMPLEX*16 CSUM,CCC,CFUN
DATA PI/712.566370614356/
CCO=(0.000,0.000)
GIA=CCO
CO=0.000
IF(RXX(N1).EQ.CO.AND.RYY(N1).EQ.CO.AND.RZZ(N1).EQ.CO) GO TO 60
L1PC=L1+1
LMINPC=IAHS(L2-L1)+1
LMAXPC=L2+L1PC
CR=PI4*(L1+L1PC)*(L2+L2+1)
CCR=DSQRT(CR)
ISN=1
IF(L2.GT.L1.AND.MOD(LMINPC,2).EQ.0) ISN=-ISN
IF(MOD(M2,2).NE.0) ISN=-ISN
NINC=N1-1
NSJ=NINC#LMTPC
NBY=N1#LMTPCS
DO 50 J=1,3
CSUM=CCC
MO=J4-2
MOPM1=MO+M1
MOPM2=MO+M2
IF(MOPM1.LT.-L1.OR.MOPM1.GT.L1.OR.MOPM2.LT.-L2.OR.MOPM2.GT.L2)
1GO TO 50
JSN=ISN
CCC1=CLSG(1,L1,L1,-MO,MOPM1,M1)
CCC2=CLSG(1,L2,L2,-MO,MOPM2,M2)
CC=CCC1#CCC2
DO 40 LT=LMINPC,LMAXPC,2
L3=LT-1
M1M2=M1-M2
IF(M1M2.LT.-L3.OR.M1M2.GT.L3) GO TO 40
MY=L3+L3+LT+M1M2
ACRS=L3+LT
CCC3=CLSG(L2,L1,L3,0,0,0)
CCC4=CLSG(L2,L1,L3,MOPM2,-MOPM1,M2-M1)
CFUN=JSN#VJ(NSJ+LT)*VYJ(NBY+MY)*CCC3#CCC4/DSQRT(ACRS)
CSUM=CSUM+CFUN
40 JSN=-JSN
CSUM=CSUM#CR
IF(MO.NE.0) CSUM=-CSUM
50 GIA=GIA+CSUM
GIA=GIA#CCR
RETURN
60 IF(L1.EQ.L2.AND.M1.EQ.M2) GIM=(1.000,0.000)
RETURN
END

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T NCLIST MAP NOXREF GOSTMT NCDECK SOURCE TERM OBJECT FIXED NCTEST
 CPT(0) LANGLVL(66) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(85) CF

.....*.....1.....2.....3.....4.....5.....6.....7.*.....

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COMPLEX FUNCTION GLM*16(N1,L1,M1,L2,M2)
  IMPLICIT REAL*8(A-H,C-Z)
  COMMON/COMO/ RAX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
  1V=(27),VYH(243),VJ(27),VYJ(243)
  2,F4(4,3),SY(4,3),TSAS(2,2),SAC(2,2),
  3A(24,2),AI(144),AF(144),AMPC(24),AEMC(24),S(24),NAME(40),ICG(3)
  COMPLEX*16 CRI,VH,VYH,VYJ,RM,SM,TSAS,SAC,
  1A,AI,AF,AYMC,AEMC,S
  COMMON/INTCOM/LMPC,LM,NLM,NLMM,N,NM,NDIM,NSPH,LMTPC,LMT,LMTPCS,
  1NS4C,NMX,NMXS,NMXV
  COMPLEX*16 CCR,CCLM,CCC,CCI,CFUN
  DATA PI4/12.5663706143567/
  CCC=(0.000,0.000)
  CCLM=CCC
  CCR=0.000
  IF(RAX(N1).EQ.CC.AND.RYY(N1).EQ.CC.AND.RZZ(N1).EQ.CC) RETURN
  CCI=(0.000,1.000)
  L1C=L1-1
  L1S=L1+1
  L1INC=IA65(L2-L1C)+1
  LMAXPC=L2+L1
  CR=PI4*(L1+L1C)*(L1+L1PC)*(L2+L2+1)/L1PC
  CCR=DSQRT(CR)*CCI
  ISN=1
  IF(L2.GT.L1MC.AND.MOD(L1MPC,2).EQ.0) ISN=-ISN
  IF(MOD(M2,2).NE.0) ISN=-ISN
  N1C=N1-1
  N1J=N1C#LMTPC
  N1Y=N1C#LMTPCS
  CCR=CCR*JM=1,3
  CCLM=CCC
  CCR=J*-2
  CCRPM1=CC+M1
  CCRPM2=CC+M2
  IF(CCRPM1.LT.-L1MC.OR.CCRPM1.GT.L1MC.OR.CCRPM2.LT.-L2.OR.CCRPM2.GT.L2)
  1GO TO 50
  CCR=ISN
  CCR1=CLGC(1,L1C,L1,-M1,CCRPM1,M1)
  CCR2=CLGC(1,L2,L2,-M2,CCRPM2,M2)
  CCR=CCLM#CCR2
  CCR4C=LT=L1MPC,LVAXPC,2
  L1=LT-1
  N1C=M1-1
  IF(L1V*2.LT.-L3.OR.M1V*2.GT.L3) GO TO 40
  N1=L3+L3+LT+M1V*2
  CCR3=L3+LT
  CCR3=CLGC(L2,L1C,L3,0,0,C)
  CCR4=CLGC(L2,L1C,L3,CCRPM2,-CCRPM1,M2-M1)
  CCRJN=JSN#VJ(NBJ+LT)*VYJ(NBY+NY)*CCR3#CCR4/DSQRT(ACRS)
  CCR4=CCR4+CFUN
40 CCR=-JSN
  CCR4=CCR4#CCR
  IF(M2.NE.0) CCR4=-CCR4
50 CCLM=GLM+CCR4
  CCR4=GLM#CCR
  RETURN
END

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1983)

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BT NOLIST MAP NOXREF GOSTMT NODECK SOURCE TERM OBJECT FIXED NOTES
CPT(0) LONGLVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85) C

.....1.....2.....3.....4.....5.....6.....7......

```

COMPLEX FUNCTION GIP*16(L1,M1,N2,L2,M2)
IMPLICIT REAL*8(A-H,C-Z)
CC*43N/DOUMD/ RXX(3),RYY(3),RZZ(3),RCS(3),CRI(3),
1V=(27),VYH(243),VJ(27),VYJ(243)
2,X4(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
3A(2,2),AI(144),AF(144),AMMO(24),AEMO(24),S(24),NAME(40),IDG(3)
CC*4PLEX*16 CRI,VH,VYH,VYJ,RV,SV,TSAS,SAC,
1W,AI,AF,AMVC,AEMC,S
CC*4MCM/INTCCM/LMPC,LM,NLM,NLMM,N,NM,NDIM,NSPH,LMTPL,LMT,LMTPCS,
1SAD,VXX,NMXS,NMXX
CC*4PLEX*16 CSUM,CCC,CFUN
DATA PI4/12.566370614356/
CCD=(0.000,0.000)
GIP=CCD
CC=0.000
IF(RXX(N2).EQ.CO.AND.RYY(N2).EQ.CO.AND.RZZ(N2).EQ.CO) GO TO 60
LIPC=L1+1
LMINPC=IABS(L2-L1)+1
LMAXPC=L2+LIPC
CR=PI4*(L1+LIPC)*(L2+L2+1)
CCR=DSQRT(CR)
ISN=1
IF(L2.GT.L1.AND.VCD(LMINPC,2).EQ.0) ISN=-ISN
IF(MOD(M2,2).NE.0) ISN=-ISN
M2=M2-1
NBJ=M2*VCD*LMTPL
NBY=M2*VCD*LMTPCS
DO 50 J=1,3
CSUM=CCC
VC=J*-2
MUPM1=VC+M1
MUPM2=VC+M2
IF(MUPM1.LT.-L1.OR.MUPM1.GT.L1.OR.MUPM2.LT.-L2.OR.MUPM2.GT.L2)
1GO TO 50
JN=ISN
CGC1=CLGC(1,L1,L1,-MUPM1,M1)
CGC2=CLGC(1,L2,L2,-MUPM2,M2)
CR=CGC1*CGC2
DO 40 LT=LMINPC,LMAXPC,2
L3=LT-1
M1M2=M1-M2
IF(M1M2.LT.-L3.OR.M1M2.GT.L3) GO TO 40
Y=L3+L3+LT+M1M2
LCP3=L3+LT
CGC3=CLGC(L2,L1,L3,C,0,0)
CGC4=CLGC(L2,L1,L3,MUPM2,-MUPM1,M2-M1)
CFUN=JN*VJ(NBJ+LT)*VYJ(NBY+NY)*CGC3*CGC4/DSQRT(ALRS)
IF(MOD(L3,2).NE.0) CFUN=-CFUN
CSUM=CSUM+CFUN
40 JN=-JN
CSUM=CSUM*CR
IF(M2.NE.0) CSUM=-CSUM
50 GIP=GIP+CSUM
GIP=GIP*CCR
RETURN
60 IF(L1.L2.AND.M1.EQ.M2) GIP=(1.000,0.000)
RETURN
END

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DATE 1984 NOV 08

TIME 10 01 10

NOLIST MAP NOXREF GCSTMT NODECK SOURCE TERM OBJECT FIXED NOTE
 OPT(0) LONGLVL(66) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....*.....1.....2.....3.....4.....5.....6.....7.*.....

```

COMPLEX FUNCTION GLP*16(L1,M1,N2,L2,M2)
IMPLICIT REAL*8(A-H,C-Z)
CC440N/DUMO/ RXX(3),RYY(3),RZZ(3),RDS(3),CRI(3),
1VH(27),VYH(243),VJ(27),VYJ(243)
2,R4(4,3),SM(4,3),TSAS(2,2),SAC(2,2),
3W(24,2),AI(144),AF(144),AMMO(24),AEMC(24),S(24),NAME(40),ICG(3)
COMPLEX*16 CRI,VH,VYH,VYJ,WM,SM,TSAS,SAC,
1A,AI,AF,AMMO,AEMC,S
COMCON/INICOM/LMPC,LM,NLM,NLMM,N,AM,NDIM,NSPH,LMTPO,LMT,LMTPCS,
1ASAC,NXX,NMXXS,NMXX
COMPLEX*16 CCP,CSUM,CCO,CCI,CFUN
DATA PI4/12.566370614356/
CCO=(0.000,C.000)
GLP=CCO
CC=0.000
IF(RXX(N2).EQ.CO.AND.RYY(N2).EQ.CO.AND.RZZ(N2).EQ.CO) RETURN
CCI=(C.CCO,1.CCO)
L1MC=L1-1
L1PC=L1+1
LMINPC=IABS(L2-L1MC)+1
LMAXPC=L2+L1
CR=PI4*(L1+L1PC)*(L2+L2+1)/L1PC
CCR=DSQRT(CR)*CCI
ISN=1
IF(L2.GT.L1MC.AND.MCO(LMINPC,2).EQ.0) ISN=-ISN
IF(MCO(M2,2).NE.C) ISN=-ISN
N2MC=N2-1
NBJ=N2*CC*LMTPC
NEY=N2*CC*LMTPCS
CC=50 JJ=1,3
CSUM=CCO
MU=JM-2
40P41=MU+M1
40P42=MU+M2
IF(40P41.LT.-L1MC.OR.40P41.GT.L1MC.OR.40P42.LT.-L2.OR.40P42.GT.L2)
100 TO 50
JSN=ISN
CGC1=CLGC(1,L1MC,L1,-MU,40P41,M1)
CGC2=CLGC(1,L2,L2,-MU,40P42,M2)
CR=CGC1*CGC2
CC=40 LT=LMINPC,LMAXPC,2
LB=LT-1
414MC=41-42
IF(414M2.LT.-LB.OR.414M2.GT.LB) GO TO 40
NY=LB*LB+LT+414M2
ACRS=LB+LT
CGC3=CLGC(L2,L1MC,LB,C,C,C)
CGC4=CLGC(L2,L1MC,LB,40P42,-40P41,42-41)
CFUN=JSN*VJ(NBJ+LT)*VYJ(NEY+NY)*CGC3*CGC4/DSQRT(ACRS)
IF(MCO(LB,2).NE.C) CFUN=-CFUN
CSUM=CSUM+CFUN
40 JSN=-JSN
CSUM=CS+4*CR
IF(MU.NE.0) CSUM=-CSUM
50 GLP=GLP+CSUM
GLP=GLP*CCR
RETURN
END

```

33)

VS FORTRAN

DATE 1984 NOV 08

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*GLIST MAP NOXREF GCSTMT NODECK SOURCE TERM OBJECT FIXED NOTES
 OPT(0) LONGLVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(65) C

.1.....2.....3.....4.....5.....6.....7......

```

FUNCTION NCCU(N1,N2,N)
  IF(N1.GT.N2) GO TO 20
  NF=N1
  NS=N2
  ISN=0
  DO 10 I=1,30
    NF=NF+1
    NS=NS-1
    ISN=ISN+1
  10 NCCU=NS-NF
    NFMC=NF-1
    IF(NFMC.EQ.0) GO TO 50
    JCCU=0
    DO 40 I=1,NFMC
  40 JCCU=JCCU+I
    NCCU=NCCU+NFMC*N-JCCU
  50 IF(ISN.EQ.1) NCCU=-NCCU
  RETURN
END
  
```

83) VS FORTRAN DATE 1984 NOV 08 TIME 10 01 13

NOLIST MAP NOXREF GOSTMT NCDECK SOURCE TERM OBJECT FIXED NOTES
OPT(0) LANGVL(66) NCFIPS FLAG(1) NAME(MAIN) LINECOUNT(85) C

.....1.....2.....3.....4.....5.....6.....7......

```
REAL FUNCTION CLGC*8(JA,JB,JC,MA,MB,MC)
IMPLICIT REAL*8(A-H,C-Z)
COMMON/COMMON/FAC1C(40),FACRM(45)
IF(MA-JA)3,4,3
CLGC=0.000
GOTO 35
IF(MA+JA)5,6,6
CLGC=0.000
GOTO 35
IF(MB-JB)3,8,7
CLGC=0.000
GOTO 35
IF(MB+JB)9,10,10
CLGC=0.000
GOTO 35
IF(JC-JC)12,12,11
CLGC=0.000
GOTO 35
IF(MC+JC)13,14,14
CLGC=0.000
GOTO 35
IF(JC-JA-JB)16,16,15
CLGC=0.000
GOTO 35
JJ1=JA+JB-JC+1
JJ2=JC+JA-JB+1
JJ3=JC-JA+JB+1
JJ4=JC+JA+JB+2
JJ5=JA+MA+1
JJ6=JA-MA+1
JJ7=JB+MB+1
JJ8=JB-MB+1
JJ9=JC+MC+1
JJ10=JC-MC+1
JJ17=-JC+JB-MA
JJ18=-JC+JA+MB
JJ19=JA+JB-JC
JJ20=JA-MA
JJ21=JB+MB
IF(JJ17)17,17,20
IF(JJ18)18,18,19
K=0
GOTO 24
K=JJ19
GOTO 24
IF(JJ19)21,21,22
K=JJ17
GOTO 24
IF(JJ17-JJ18)19,19,21
IF(JJ21-JJ19)25,25,26
IF(JJ19-JJ20)23,23,27
KK=JJ21
GOTO 25
KK=JJ19
GOTO 25
IF(JJ21-JJ20)25,25,26
KK=JJ20
GOTO 25
I=K
IF(K-2*(K/2))31,30,31
BOY=1.000
GOTO 32
BOY=-1.000
JJ11=I+1
JJ12=JJ1-I
JJ13=JJ6-I
JJ14=JJ7-I
JJ15=JC-JB+MA+I+1
JJ16=JC-JA-MB+I+1
P=BOY*FAC1C(JJ11)*FAC1C(JJ12)*FAC1C(JJ13)
I=FAC1C(JJ14)*FAC1C(JJ15)*FAC1C(JJ16)
BOY=BOY*BOY/PACCU
IF(I-KK)33,34,34
I=I+1
BOY=-BOY
GOTO 32
ARG=2*JC+1
```

33)

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.*....1.....2.....3.....4.....5.....6.....7.*.....

```
SQUA 2=FACTC (JJ4)
SQUA 3=FACTC (JJ5)*FACTC (JJ6)*FACTC (JJ7)
1*FACTC (JJ8)*FACTC (JJ9)*FACTC (JJ10)
SQUA 4=SQUA 1*SQUA 3/SQUA 2
CLGO=SUM*DSQRT(SQUA 4)
RETURN
END
```


3) VS FORTRAN DATE 1984 NOV 08 TIME 10 01 16
 VLIST MAP ACXREF GUSTMT NOCHECK SOURCE TERM OBJECT FIXED NOTE
 OPT(0) LONGLVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

...1.....2.....3.....4.....5.....6.....7......

```

SUBROUTINE RBF(X,N,JCK,FJ,IIR)
IMPLICIT REAL*8(A-H,C-Z)
DIMENSION FJ(100)
IIR=0
JCK=JCK
IF(X-1.00-0)7,11,11
FJ(1)=1.
IF(N)10,10,8
M=M+1
DO 3 M=2,MM
FJ(M)=0.
DO 10 3
FAC=1.24*X+0.5
TST=+.21*+.342944819*DLG(X)+3.
IF(2.-TST)13,12,12
DELTA=2.
DO 10 14
DELTA=TST
FN=1
IF(FN-FAC)15,15,16
FNS=FAC+DELTA
DO 10 17
FNS=FNS+DELTA
NS=FN+1.
JCK=JCK+2
IF(JCK-JCK)21,21,18
IIR=1
RETURN
FJ(NS+1)=0.
FJ(NS)=1.00-45
M=M-1
FJ(1)=(FJ(FM+3.)/X)*FJ(M+1)-FJ(M+2)
IF(DABS(FJ(1))-1.00+40)23,33,33
IF(1-1)25,25,24
M=M-1
FJ(FM+1)=1.
DO 10 22
IF(X-.2)26,27,27
XX=X*X
XXX=XX*XX
X4=XXX*XX
SER=1.-X/6.+XXX/120.-X6/5040.
SER=FJ(1)/SER
DO 10 31
SER=FJ(1)*X
IF(DABS(SER)-.1)28,29,29
IF(X-.11)27,29,30
SER=X*FJ(1)/SER
DO 10 31
SER=X*FJ(1)/SER
FJ(1)=FJ(1)/SER
SER=X*FJ(2)/(SER/X-DCOS(X))
DO 10 31
M=M+1
DO 32 M=JJ,MM
FJ(M)=FJ(M)/SER
DO 10 30
M=M+1
DO 32 M=JJ,MM
FJ(M)=FJ(M)*1.00-45
DO 10 31
DO 32 M=JJ,MM

```

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LIST	MAP	NOXREF	SUSTMT	NODECK	SOURCE	TERM	OBJECT	FIXED	NOTES
OPT(0)	LANGVL(66)	NCFIPS	FLAG(1)	NAME(MAIN)			LINECOUNT(85)		C

..1.....2.....3.....4.....5.....6.....7.*.....

```

SUBROUTINE RNF(X,L,FN)
  IMPLICIT REAL*8(A-H,O-Z)
  DIMENSION FN(9)
  F(X,LT,0.000,GR,L,LT,0) RETURN
  PJ=L+1
  F(X,LT,0.000) GO TO 20
  C 10 I=1,LPU
  N(I)=-1.00+50
  RETURN
  N1=-0.000(X)/X
  N2=(F(X,1)-0.5*IN(X))/X
  N(1)=FN1
  N(2)=FN2
  F(L,LT,2) RETURN
  I=1.000/X
  JC=L-1
  C 30 I=1,L*G
  IPU=1+I+1
  PT=I+2
  NO=FN1
  N1=FN2
  NC=FN1*X1*ITPU-FNC
  N(IPU)=FN2
  RETURN
  NO

```

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THE OPTICAL SPECTRA OF AEROSOLS(U) MESSINA UNIV (ITALY) 2/2
IST DI STRUTTURA DELLA MATERIA F BORGHESE FEB 85
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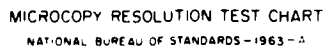
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

IN EFFECT NOLIST MAP NCXREF GLSTMT NCDECK SOURCE TERM OBJECT FIXED
 LPT(0) LANGVL(66) NCFIPS FLAG(1) NAME(MAIN) LINECUNT(85)

.....1.....2.....3.....4.....5.....6.....7...

```

1      SUBROUTINE CBF(X,N,JCN,FJ,IIR)
2      IMPLICIT REAL*8(A-H,C-Z)
3      DIMENSION FJ(100)
4      COMPLEX*16 FJ,X,XX,XXXX,X6,SER,CCN,CCN1
5      IIR=0
6      Y=CDABS(X)
7      ICK=JCN
8      IF(Y-1.00-2)7,11,11
9      FJ(1)=1.
10     IF(I)11,10,8
11     NV=N+1
12     DO 5 V=2,NV
13     FJ(V)=0.
14     RETURN
15     FNC=1.04*Y+6.5
16     TST=4.21*CDCLS(X)+3.
17     IF(2.-TST)13,12,12
18     DELTA=2.
19     DO 10 I=14
20     DELTA=TST
21     FNC=FNC-DELTA
22     IF(FNC-FNC)15,15,16
23     FNC=FNC+DELTA
24     DO 10 I=17
25     FNC=FNC+DELTA
26     NS=FNC+1.
27     ICK=NS+2
28     IF(ICK-JCN)21,21,16
29     IIR=1
30     RETURN
31     FJ(NV+1)=1.
32     FJ(,5)=(1.00-37,1.00-37)
33     V=5-1
34     NV=V-1
35     FJ(V)=((FJ(V)+FJ(V+3.)/X)*FJ(V+1)-FJ(V+2))
36     IF(CDABS(FJ(V))-1.033)23,33,33
37     IF(V-1)25,25,24
38     V=V-1
39     FV=FV-1.
40     DO 10 I=32
41     IF(Y-.32)26,27,27
42     XX=X*X
43     XXXX=XX*XX
44     AC=XXXX*XX
45     SER=1.-XX/6.+XXXX/120.-X6/5040.
46     CC1=FJ(1)/SER
47     JU=1
48     DO 10 I=31
49     SE1=CDOSIN(X)
50     IF(CDABS(SE1)-.1)28,29,29
51     IF(Y-.11)29,29,30
52     CC1=X*FJ(1)/SER
53     JU=1
54     DO 10 I=31
55     CC1=X*FJ(1)/SER
56     FJ(1)=FJ(1)/CCN1
57     CC1=X*FJ(2)/(SER/X-CDCLS(X))
58     JU=2
59     NV=N+1
60     DO 32 V=JU,NV
61     FJ(V)=FJ(V)/CCN
62     RETURN
63     JU=V+1
64     DO 34 J=JU,NS
65     FJ(J)=FJ(J)*1.00-33
66     DO 10 I=22
67     END
    
```

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EFFECT NOLIST MAP NOXREF GCSTMT NCDECK SOURCE TERM OBJECT FIXED NOTES
OPT(3) LANGLVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECCUNT(85) C.

.....1.....2.....3.....4.....5.....6.....7......

SUBROUTINE POLAR(X,Y,Z,R,CTH,STH,CPH,SPH)

IMPLICIT REAL*8(A-H,C-Z)

RHC=X*X+Y*Y

IF(RHC.GT.0.000) GO TO 10

CPH=1.000

SPH=0.000

R=ABS(Z)

IF(R.GT.0.000) GO TO 15

CTH=1.000

STH=0.000

RETURN

10 R=DSQRT(RHC+Z*Z)

RHC=DSQRT(RHC)

CPH=X/RHC

SPH=Y/RHC

15 CTH=Z/R

STH=RHC/R

RETURN

END

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EFFECT ACLIST MAP NCXREF GCSTMT NCDECK SOURCE TERM OBJECT FIXED NOTES
 OPT(0) LANGLVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

..........1.....2.....3.....4.....5.....6.....7.*.....

SUBROUTINE SPHAR

1 (CCSRTH, SINRTH, CCSRPH, SINRPH, LMPC, YLJRS)

IMPLICIT REAL*8(A-H, C-Z)

DIMENSION SINRMP(9), CCSRMP(9), PLMRS(45), YLJRS(81)

CC44CN/DUM6/FACTC(40), FNCKM(45)

COMPLEX*16 YLJRS

LM=LMPC-1

SINRMP(1)=0.000

CCSRMP(1)=1.000

SINRMP(2)=SINRPH

CCSRMP(2)=CCSRPH

IF(LMPC-2) 3, 3, 6

DO 7 J=3, LMPC

K=J-1

SINRMP(J)=SINRPH*CCSRMP(K)+CCSRPH*SINRMP(K)

CCSRMP(J)=CCSRPH*CCSRMP(K)-SINRPH*SINRMP(K)

CONTINUE

X=CCSRTH

AA=0.405(X)

Y=0.433(SINRTH)

IF(XA-1.00-6) 9, 9, 18

L=0

LAVE=(L*(L+1))/2+1

TAVE=2.000*L

M=0

K=L+M

IF(X-2*(K/2)) 12, 13, 12

J=LAVE+M

PLMRS(J)=0.000

GO TO 14

IA=K+1

IB=I/2+1

IC=(L-M)/2

ID=JIC+1

JE=LAVE+M

PLMRS(J)=(((-1)**JC)*FACTC(IA))/(TAVE*FACTC(IB)*FACTC(IC))

IF(X-L) 15, 16, 16

M=M+1

J=LAVE+M

IF(L-LM) 17, 40, 40

L=L+1

GO TO 10

IF(XA-0.99999900) 28, 19, 19

PLMRS(1)=1.000

PLMRS(2)=X

L=2

J=(L*(L+1))/2+1

A=L

B=2*L-1

C=L-1

K=J-L

M=J-L+L+1

PLMRS(J)=(3*X*PLMRS(K)-C*PLMRS(M))/A

IF(L-LM) 21, 22, 22

L=L+1

GO TO 20

L=1

M=1

LAVE=(L*(L+1))/2+1

J=LAVE+M

PLMRS(J)=0.000

IF(X-L) 25, 26, 26

M=M+1

GO TO 24

IF(L-LM) 27, 40, 40

L=L+1

GO TO 23

PLMRS(1)=1.000

PLMRS(2)=X

PLMRS(3)=Y

PLMRS(5)=3.000*Y*X

L=2

J=(L*(L+1))/2+1

A=L

B=2*L-1

C=L-1

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.....1.....2.....3.....4.....5.....6.....7......

```

      PLMRS(J)=(B*X*PLMRS(K)-C*PLMRS(M))/A
      IF(L-LM) 30,31,31
30    L=L+1
      GO TO 29
31    L=3
32    J=(L*(L+1))/2+2
      A=L-1
      B=2*L-1
      C=L
      K=J-L
      M=J-2*L+1
      PLMRS(J)=(B*X*PLMRS(K)-C*PLMRS(M))/A
      IF(L-LM) 33,34,34
33    L=L+1
      GO TO 32
34    L=2
35    M=1
      LAVE=(L*(L+1))/2+1
36    J=LAVE+M+1
      K=J-1
      M=K-1
      EAT=M
      A=(2.000*EAT*X)/Y
      B=(M+L)*(L-M+1)
      PLMRS(J)=A*PLMRS(K)-B*PLMRS(M)
      IF(M+1-L) 37,38,38
37    M=M+1
      GO TO 36
38    IF(L-LM) 39,40,40
39    L=L+1
      GO TO 35
40    CONTINUE
      L=3
41    J=3
      KAVE=L*(L+1)
      LAVE=KAVE+1
      MAVE=KAVE/2+1
42    IF(J) 44,43,44
43    YLUPS(LAVE)=FLOXP(MAVE)*PLMRS(MAVE)
      GO TO 45
44    JA=MAVE+J
      SAVE=FLOXP(JA)*PLMRS(JA)
      MA=J+1
      IA=LAVE+J
      YLUPS(IA)=SAVE*DCMPLX(COSAMP(MA), SINAMP(MA))
      IF(MA-2) 46,47,47
      YLUPS(IA)=-YLUPS(IA)
      IA=LAVE-J
      YLUPS(IA)=SAVE*DCMPLX(COSAMP(MA), -SINAMP(MA))
45    IF(J-L) 46,47,47
46    J=J+1
      GO TO 44
47    IF(L-LM) 48,49,49
48    L=L+1
      GO TO 41
49    CONTINUE
      RETURN
      END

```


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OBJECT ACLIST MAP NCXREF GCSTMT NODECK SOURCE TERM OBJECT FIXED NOTEST
 OPT(0) LANGVLVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85) CH

.....1.....2.....3.....4.....5.....6.....7......

```

SUBROUTINE CSMINV(AM,V,NDDMST,N,MODE,IER,VCUT)
IMPLICIT REAL*8 (A-H,O-Z)
DIMENSION AM(NDDMST,1),V(1)
COMPLEX*16 AM,DET,CSUM,CTEMP,CDET
DATA CCONST/3.5527136738005D-17/
IER=0
NMINUS=N-1
PTEST = (4.000*CCONST*N)**2
1200 IF(N.NE.1) GO TO 1300
DET=AM(1,1)
IF( DABS(DREAL(DET))+DABS(DIMAG(DET)) .EQ. 0.0D0) GO TO 5200
AV(1,1) = (1.000,C.000)/DET
RETURN
1300 DO 1309 I=1,N
SUM=0.000
DO 1319 J=1,N
SUM = SUM +DREAL(AM(I,J))**2 +DIMAG(AM(I,J))**2
1319 CONTINUE
V(I)=1.000/SUM
1309 CONTINUE
DET=1.000
DO 2019 K=1,N
KPLUS=K+1
KMINUS=K-1
L=K
PSMAX=0.000
DO 2029 I=K,N
CTEMP = -CDET*(-AM(I,K),AM(I,1),AM(1,K),KMINUS,NDDMST)
AM(I,K)=CTEMP
PSJ = V(I)*(DREAL(CTEMP)**2 +DIMAG(CTEMP)**2 )
IF(PSJ.LE.PSMAX) GO TO 2029
PSMAX=PSJ
L=I
2029 CONTINUE
VTEMP=V(K)
IF(L.EQ.K) GO TO 2011
DO 2049 J=1,N
CTEMP=AM(K,J)
AM(K,J)=AM(L,J)
AM(L,J)=CTEMP
2049 CONTINUE
VTEMP=V(L)
V(L)=V(K)
V(K)=VTEMP
CTI=-CET
2011 DET = AM(K,K)*DET
IF(MODE.NE.0) DET=DSQRT(VTEMP)*DET
V(K)=L
IF(PSMAX.LE.PTEST) GO TO 5200
CTEMP = 1.000/AM(K,K)
AM(K,K)=CTEMP
IF(KPLUS.GT.N) GO TO 2019
DO 2059 J=KPLUS,N
AM(K,J) = -CTEMP*CDET*(-AM(K,J),AM(K,1),AM(1,J),KMINUS,NDDMST)
2059 CONTINUE
2019 CONTINUE
DO 4109 K=1,NMINUS
KPLUS=K+1
DO 4119 I=KPLUS,N
AM(I,K) = -AM(I,1)*CDET((0.000,0.000),AM(I,K),AM(K,K),I-K,
NDDMST)
AM(K,I) = -CDET(AM(K,I),AM(K,KPLUS),AM(KPLUS,I),I-K-1,NDDMST)
4119 CONTINUE
4109 CONTINUE
DO 4209 K=1,N
DO 4219 I=1,N
IF(I.GE.K) GO TO 4212
AM(I,K) = CDET((0.000,0.000),AM(I,K),AM(K,K),N-K+1,NDDMST)
GO TO 4219
4212 AM(I,K) = CDET(AM(I,K),AM(I,I+1),AM(I+1,K),N-I,NDDMST)
4219 CONTINUE
4209 CONTINUE
DO 4309 L=1,N
K=I-L+1
KCOL=ICINT(V(K))
IF(KCOL.EQ.K) GO TO 4309
DO 4319 I=1,N
CTEMP=AM(I,K)

```

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.....1.....2.....3.....4.....5.....6.....7......

```
      AV(I,KCCL)=CTEMP
4319  CONTINUE
4309  CONTINUE
      GO TO 6000
5200  IER=1
      RETURN
6000  IF(VCUT.EQ.C.CDO) RETURN
      CDO=(0.000,C.000)
      CO=0.000
      ICUT=0
      DO 6260 I=1,N
      DO 6250 J=1,N
      DET=AV(I,J)
      AMR=DREAL(DET)
      AMI=DIVAG(DET)
      IF(AMR.EQ.CO.AND.AMI.EQ.CO) GO TO 6260
      IF(AMR.EQ.CO.OR.DABS(AMR).GT.VCUT) GO TO 6250
      AMR=CO
      ICUT=ICUT+1
6250  IF(AMI.EQ.CO.OR.DABS(AMI).GT.VCUT) GO TO 6255
      AMI=CO
      ICUT=ICUT+1
6255  AV(I,J)=DCVPLX(AMR,AMI)
6260  CONTINUE
      RETURN
      END
```

DAY 1983)

VS FORTRAN

DATE 1984 NOV 08

TIME 10 01 30

ECT NOLIST MAP NOXREF CDSMT NODECK SOURCE TERM OBJECT FIXED NOTES
EPT(0) LANGEVL(66) NOFIPS FLAG(1) NAME(MAIN) LINECOUNT(85)

.....1.....2.....3.....4.....5.....6.....7......

COMPLEX FUNCTION CDSMT*16(Z,A,B,N,ISTEP)

COMPLEX*16 Z,A(1),B(1)

CDSMT=Z

IF(N) 4,1,2

2 DO 3 J=1,N

3 CDSMT=CDSMT+A*(1+(J-1)*ISTEP)*B(J)

4 RETURN

END

OUTPUT DESCRIPTION

In this section we give the meaning of the output quantities of all the programs.

When IWCSS=1 the programs write the cross sections of each one of the spheres in the cluster:

SCASEC	}	Scattering, absorption and total cross section for the spheres in the cluster, respectively.
ABSSEC		
TOTSEC		

QSCAS	}	Ratio between the scattering, absorption and total cross section, respectively, and the geometrical cross section of the spheres.
QARSS		
QTOTS		

The some quantities are written for the cluster as a whole, so that:

SCASEC	}	Scattering, absorption and total cross section, respectively, for the cluster.
ABSSEC		
TOTSEC		

QSCAS	}	Ratio between the scattering, absorption and total cross section of the cluster, and the sum of the geometrical cross section of the constituent spheres, respectively.
QARSS		
QTOTS		

Furthermore the programs write the following informations relative to the cluster as a whole:

SCARAT	}	Ratio between the cross sections of the cluster and the sum of the corresponding cross sections of the constituent spheres calculated according to the Mie theory.
ABSRAT		
TOTRAT		

The last information written by the programs is marked 11 and 21 if IHELP=+1, and 22, 12 if IHELP=-1.

11 is the 11 component of the normalized forward scattering cross section of the cluster, while 21 is the 21 component of

the same quantity. Analogous meaning have the quantities marked 22 and 12.

Furthermore, 11 also marks the quantities

$$\frac{\operatorname{Re} \underline{f}_{\gamma\gamma}(\text{cluster})}{\operatorname{Re} \sum \underline{f}_{\gamma\gamma}(\text{spheres})} \quad \text{and} \quad \frac{\operatorname{Im} \underline{f}_{\gamma\gamma}(\text{cluster})}{\operatorname{Im} \sum \underline{f}_{\gamma\gamma}(\text{spheres})}$$

According to ref.(5) these quantities are related to the macroscopic optical constants of an assembly of clusters with low density.

TABLE I

Number of the elements of the T-matrix (EN) for a cluster of N spheres with a given L_M . The actual memory requirements for this matrix is obtained by multiplying EN by 16. The asterisk marks the entries corresponding to clusters that can be handled by PRG2. All the other entries correspond to clusters that must be handled by PRG3. The maximum capability of PRG3 is a cluster of 70 spheres with $L_M=1$. This requires to handle a T-matrix with 176400 elements. The total memory requirement of the program is of 4 Mbytes.

N	L_M	EN
* 4	3	14.400
*	4	36.864
	5	78.400
	6	147.456
* 5	3	22.500
*	4	57.600
	5	122.500
* 6	2	9.216
*	3	32.400
	4	82.944
	5	122.400
* 7	2	12.544
*	3	44.100
	4	112.896
* 8	2	16.384
*	3	57.600
	4	147.456

1.1, CLASS=7, USER=1001701, POF 00101

1.1, CLASS=7, USER=1001701, POF 00101

1.1, CLASS=7, USER=1001701, POF 00101, MODE=3

1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000

1.1, CLASS=7, USER=1001701, POF 00101, MODE=3

1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000
1.1	0.000000	0.000000	0.000000	0.000000	0.000000

1.1, CLASS=7, USER=1001701, POF 00101, MODE=3

44 RECORDS

.....1.....2.....3.....4.....5.....6.....7.....8.....9.....0.....

TEST, DEVS=7, USER='000701, SOURCE=50'

STANDARD
STANDARD

1.	0.00	0.00	0.00	0.00	0.00
1.	0.00	-0.716771	0.00	0.00	0.00
1.	0.00	-0.716771	0.00	0.00	0.00
1.	0.00	0.00	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00

14. 0.00 0.10000000-00
TEST, DEVS=7, USER='000701, SOURCE=50'
STANDARD, CONTAIN, NU=1.4, AB=1.5, MODE=3

1.	0.00	0.00	0.00	0.00	0.00
1.	0.00	-0.716771	0.00	0.00	0.00
1.	0.00	-0.716771	0.00	0.00	0.00
1.	0.00	0.00	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00
1.	0.00	0.0000	0.00	0.00	0.00

14. 0.00 0.10000000-00
TEST, DEVS=7, USER='000701, SOURCE=50'
STANDARD, CONTAIN, NU=1.4, AB=1.5, MODE=3

END

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